# Royal Armoured Corps

# TANK MUSEUM

KENNETH W. LARSEN
17206 COMMUNITY,
LANSING, ILL.

**BOVINGTON CAMP - - DORSET**

## AN ILLUSTRATED RECORD of the BRITISH ARMOURED FIGHTING VEHICLE

●

## ARMOURED CARS

**1900 – 1963**

**with a supplement on FOREIGN ARMOURED CARS**

●

**Price: THREE SHILLINGS and SIXPENCE**

The following publications are on sale at the Museum:—

TANKS: 1915-1918. The First World War.

TANKS: 1919-1939. The Inter War Period.

TANKS: 1940-1946. The Second World War.

ARMOURED CARS: 1900-1963.

TANKS OF OTHER NATIONS:

Also Regimental Histories of most of the Regiments of the Royal Armoured Corps.

Every effort has been made to ensure the accuracy of the information given, but the Curator would welcome particulars of any inaccuracies which have inadvertently been included.

*Revised and reprinted 1964*

*Copyright reserved*

THE ROYAL ARMOURED CORPS

•

# TANK
# MUSEUM

•

## ARMOURED CARS

1900 - 1963

•

ROYAL ARMOURED CORPS CENTRE
BOVINGTON CAMP, Nr. WAREHAM, DORSET

# CONTENTS


INTRODUCTION

THE FIRST WORLD WAR

BETWEEN THE WARS

THE SECOND WORLD WAR

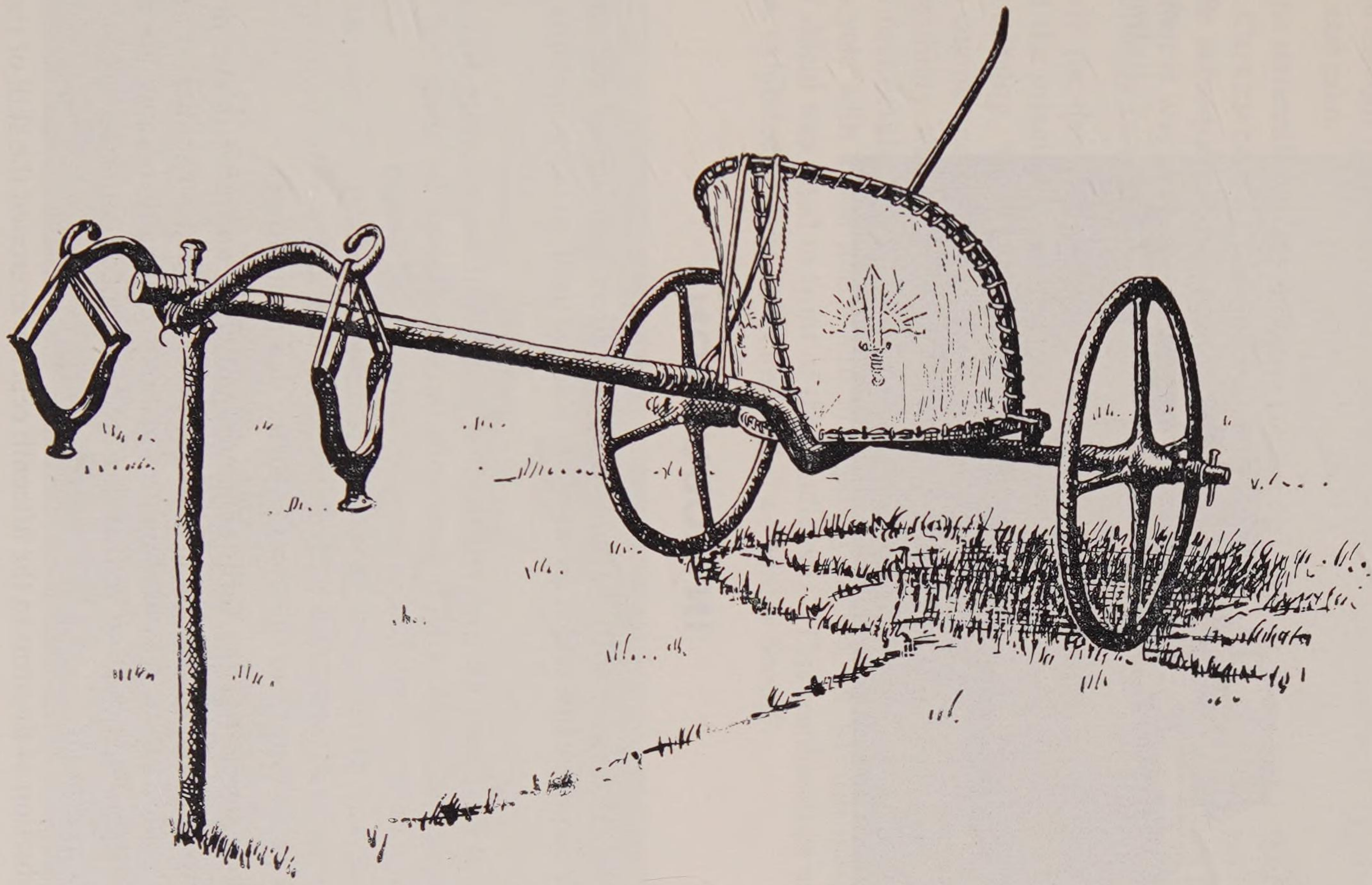
DEVELOPMENTS AFTER 1945

APPENDIX

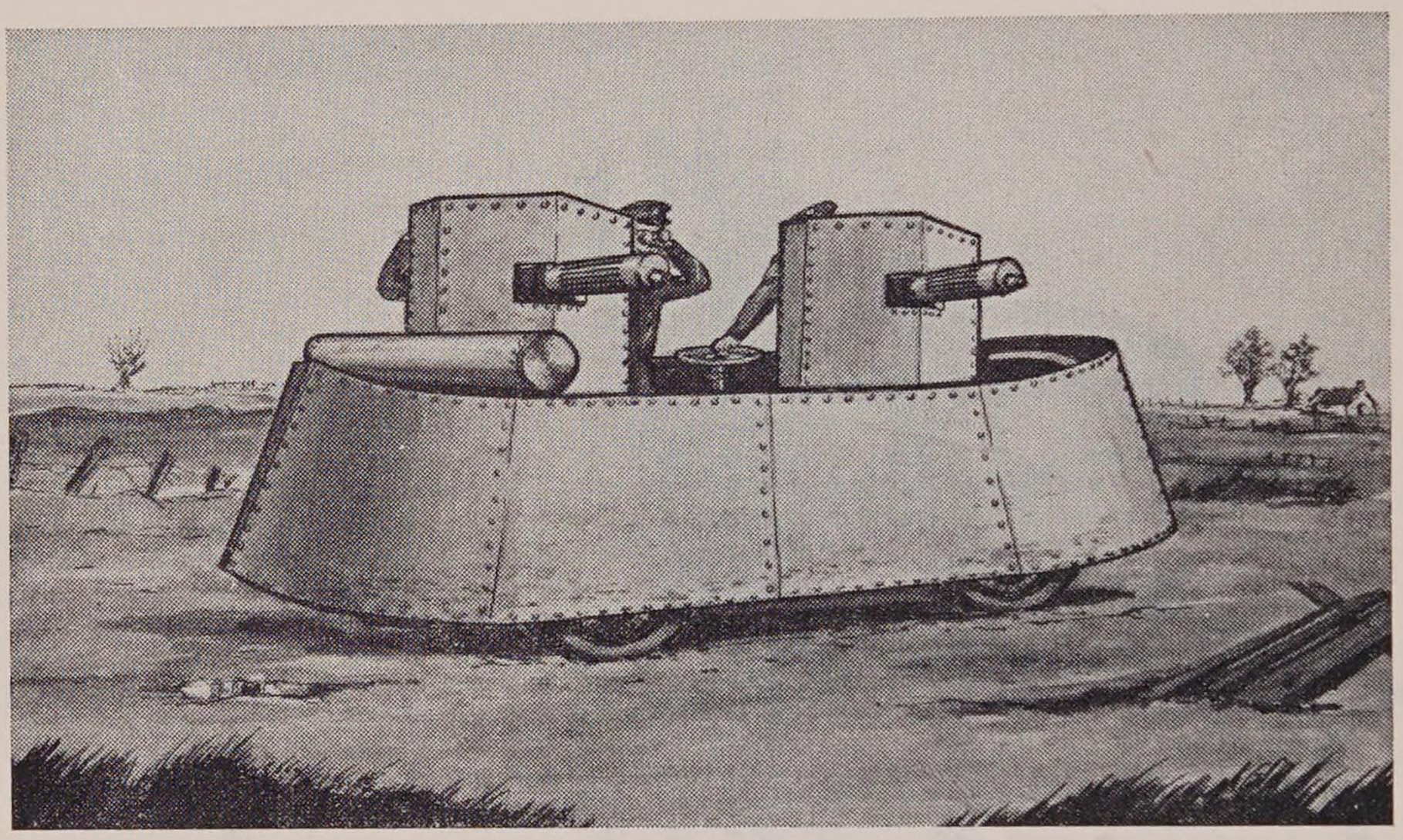
COMPARATIVE TABLE OF ARMOURED, SCOUT AND RECONNAISSANCE CARS USED BY THE BRITISH ARMY

SUPPLEMENT

FOREIGN ARMOURED CAR DEVELOPMENT



*Early Egyptian Warchariot*



*Pennington's sketch for an Armoured Car, 1896*

# INTRODUCTION

The armoured car may truly be said to be the direct ancestor of the tank and was evolved to fulfil requirements which are as old as warfare itself, namely, mobility, protection and firepower.

The Ancient Egyptians were among the first to use light war chariots drawn by horses. The large Assyrian chariots, which were sometimes protected by sheets of rawhide or bronze, carried a crew of three who wore body armour and helmets.

In the same way the use of siege vehicles represented a form of armoured car in that they were wheeled and armoured with hides whilst the crews would comprise archers with overhead protection from the missiles of the defending force.

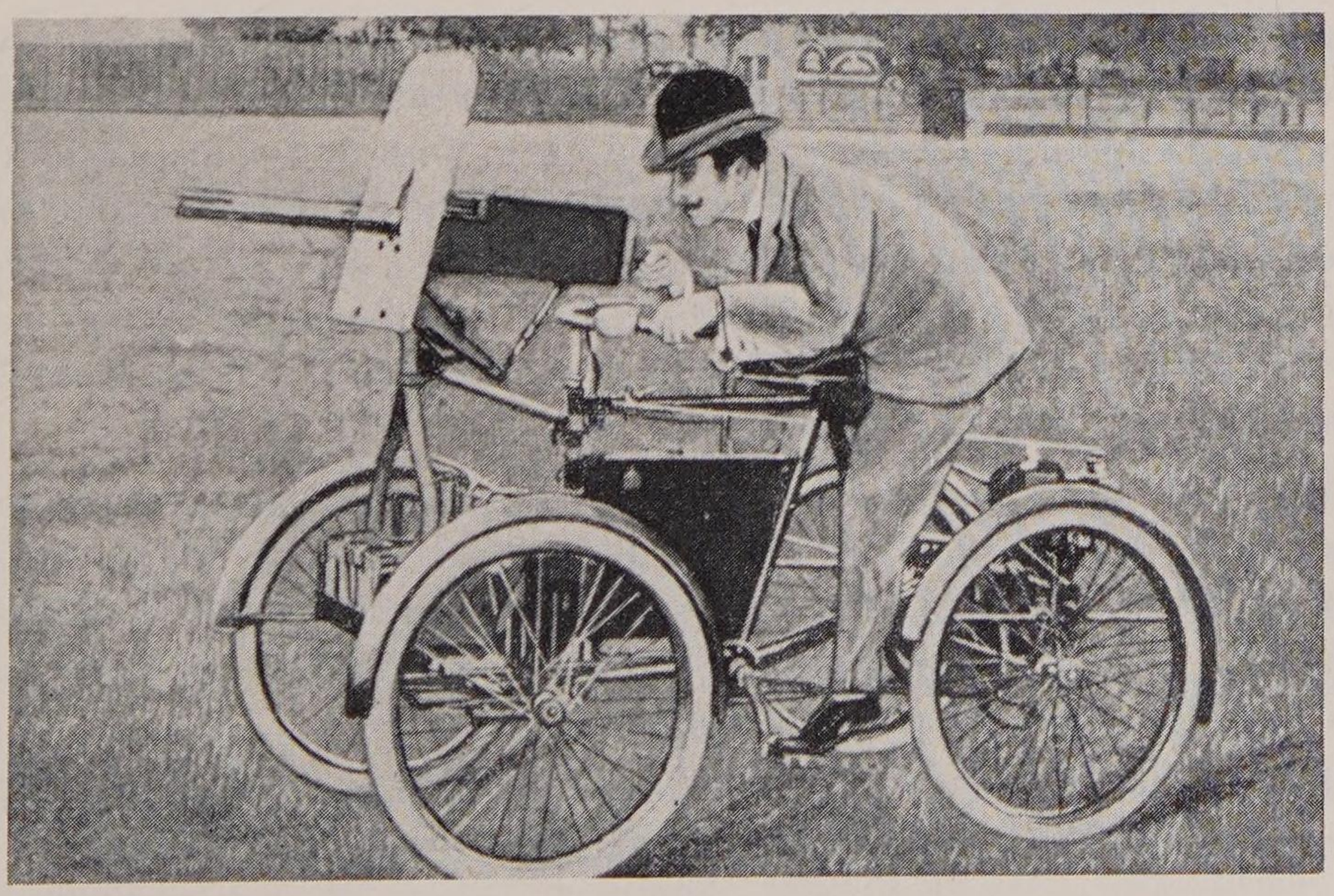
Individual protection in the form of chain mail coats appeared in the ninth century B.C., but effective armour protection proved too heavy for the foot soldier. The horseman, however, who could carry a greater weight of armour, gradually became the decisive arm and for a time superseded the foot soldier in Europe except in countries unable to meet the cost of knights in armour.

The introduction of firearms in the fifteenth century exercised the skill of the armourers in providing complete suits of armour both for man and beast. But as the firearm developed

the weight of armour required to give complete protection became so heavy as to immobilise both horse and man.

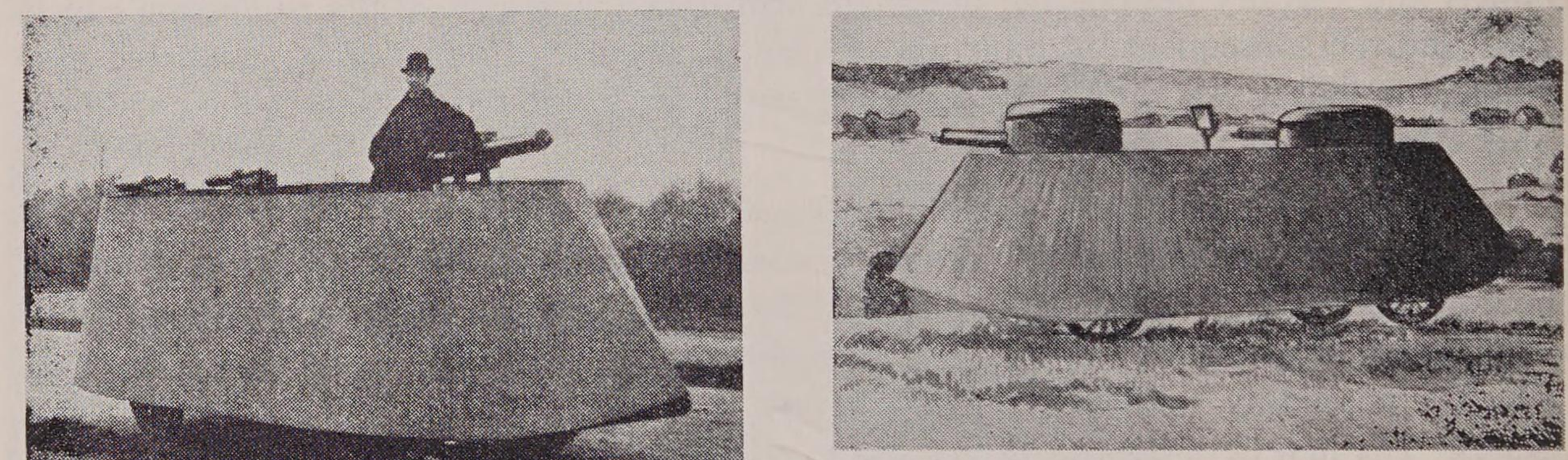
After the sixteenth century mobility superseded armour as a means of protection from bullets and Cavalry became the dominant arm until the advent of the percussion cap in 1807 and the subsequent introduction of long range, quick firing weapons rendered it so vulnerable that it was only able to operate with unacceptable losses unless the conditions were exceptionally favourable.

Not until the dawn of the mechanical age, with the ability of again carrying heavier armour, did the principle of protection re-assert itself and the automotive fighting vehicle become a possibility. The latter half of the nineteenth century saw the advent of the internal combustion engine and the use of steam engines as the motive power for traction engines, but this possibility was not exploited except for one or two experiments in the United States. The first development of the motor vehicle for military use was a de Dion-Bouton type quadricycle with a one and a half horsepower engine. A Maxim machine gun and bullet proof shield was fitted in front of the handle bars. This combination was devised by F. R. Simms, exhibited in June 1899, and called a "Motor Scout".



*F. R. Simms' Motor Scout 1899*

In 1900 Simms was engaged on the development of a "War Car" to the order of Vickers, Sons and Maxim Ltd. It was exhibited in 1902 at the Crystal Palace.



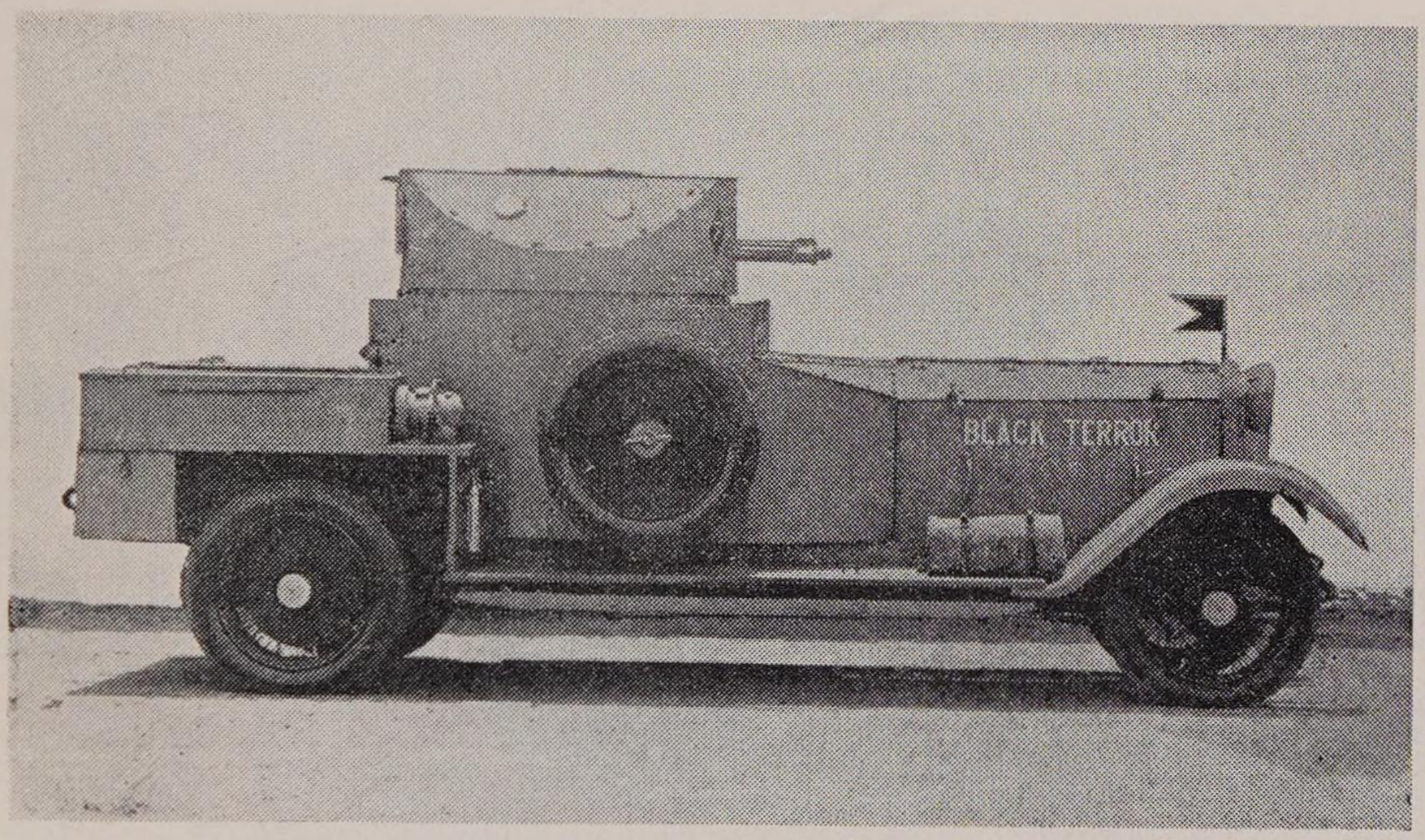
*The Simms War Cars*

The machine exhibited did not have the two gun turrets shown in the drawings. Its armament of two Maxim machine guns and a pom-pom (automatic 1-pr.) projected above the hull, some contemporary photographs show them with and some without protective shields. The boat shaped open top hull, with rams fore and aft, was built of 6 mm. Vickers armour and mounted on a four wheel chassis powered by a 16 h.p. four cylinder Daimler engine. The drive was through a four speed gearbox and in top gear the car was stated to have a top speed of 9 m.p.h. Its weight fully laden was $5\frac{1}{2}$ tons and it had steel tyred wheels which restricted its use to hard road surfaces.

The "War Car" has been described as an invention of Simms but its conception was certainly not his alone. A similar vehicle had been proposed six years earlier by E. J. Pennington, an American inventor, whose ideas were first made public in 1896. In fact Pennington never produced anything but sketches of his designs but these were given a good deal of publicity and attracted considerable interest.

The similarity between the "War Car" and Pennington's drawings is unmistakable and it seems probable that Simms was influenced by Pennington's ideas.

Despite the interest aroused no practical developments resulted and after this failure no further work of this type was done in the United Kingdom until 1914.



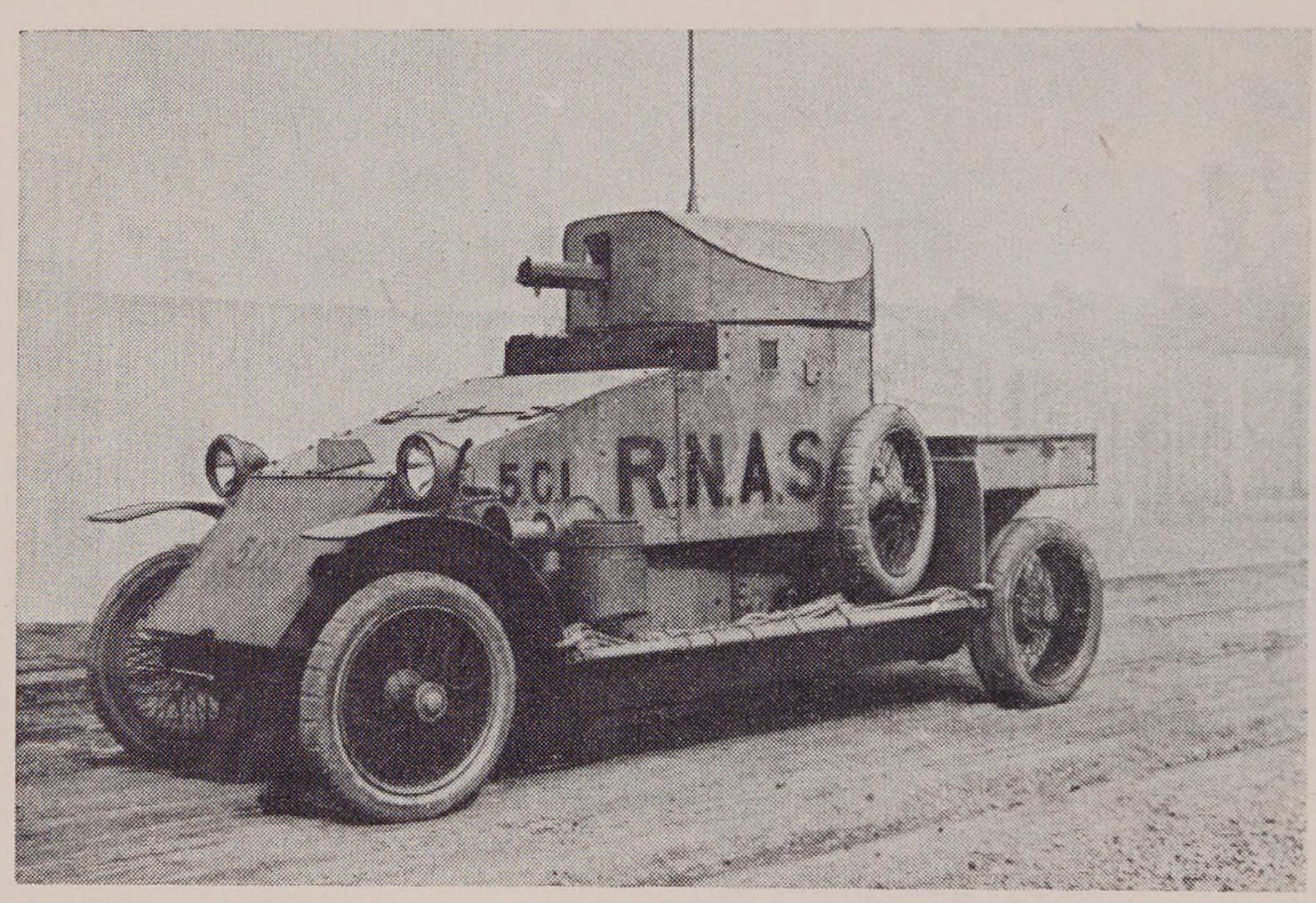

*Rolls Royce 1914*

## THE FIRST WORLD WAR

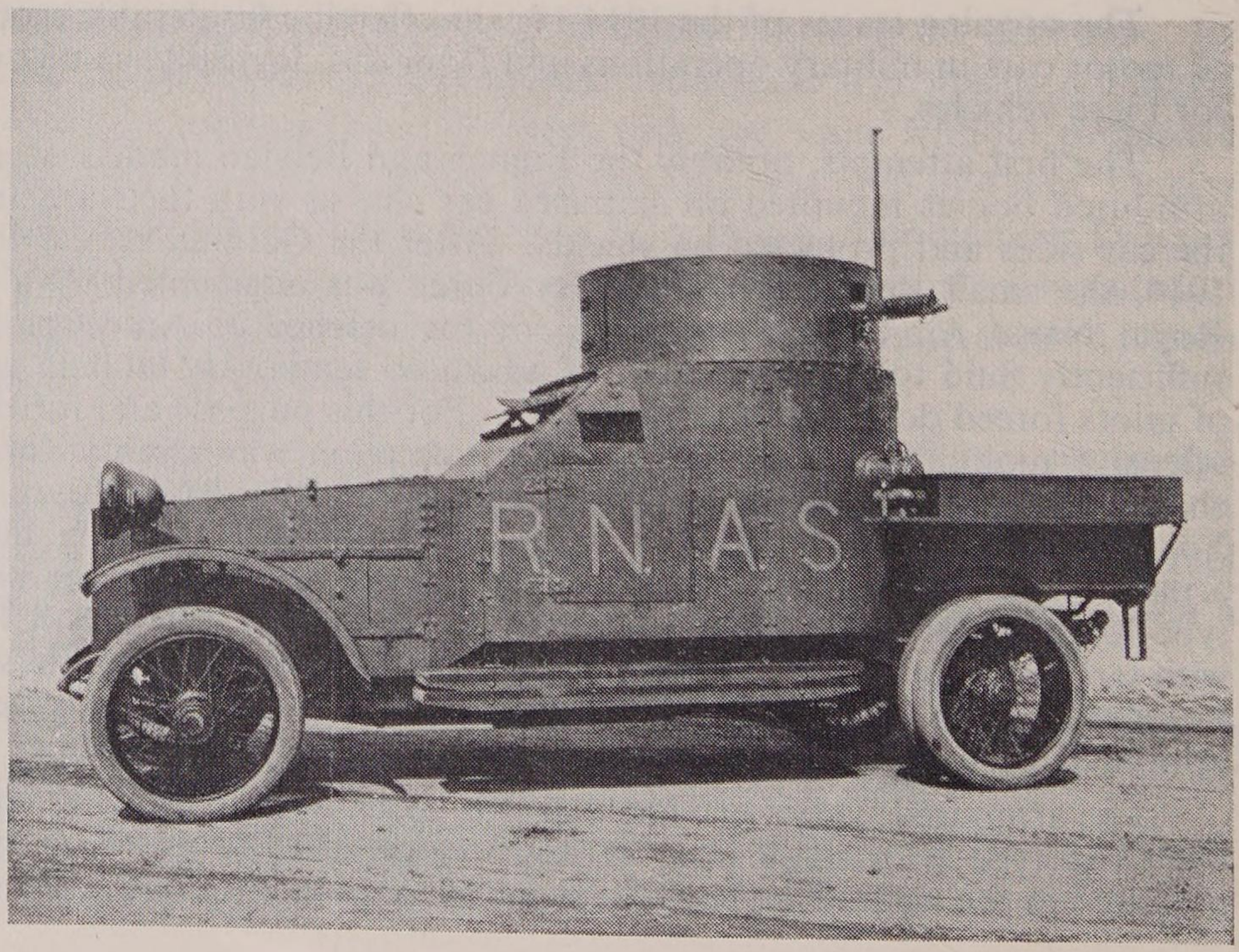
The opening stages of the 1914-18 war offered considerable scope for the employment of motor cars in military operations and from this, logically, came the provision of armour for these vehicles.

The first attempts, notably the French and Belgian models, were simple open topped armoured bodies mounted on standard car chassis with their armament projecting above the car sides and protected by shields. After the German retreat to the Aisne in August 1914, the small British Expeditionary Force was augmented by a Naval Brigade and a Royal Naval Air Service Squadron for the defence of Antwerp. Conditions were still sufficiently fluid to permit the use of advanced temporary landing grounds and the rescue of pilots forced down in enemy territory. For this purpose and for the defence of Antwerp offensive mobility as well as armoured protection was essential and the Admiralty purchased 100 cars and chassis of various makes including Rolls Royce, Talbot and Wolseley. To meet immediate operational needs whilst these were being fitted with armour and armament in the U.K., a Mercedes and Rolls Royce car together with two L.G.O.C. "B" type lorry chassis and a 5 ton Mercedes lorry chassis, already in France, were provided with temporary armour of mild steel plates at the Forges et Chantiers de France steel works at Dunkirk. The L.G.O.C. and Mercedes lorries represent early versions of the wheeled armoured personnel carrier since they could carry up to 12 men.

The armoured bodies produced at this stage, both in the U.K. and France, were of the open top type with some kind of hood to protect the driver's head and a machine gun mounted in the well of the body so as to fire over the top of the side armour. As time and




*Lanchester 1914*



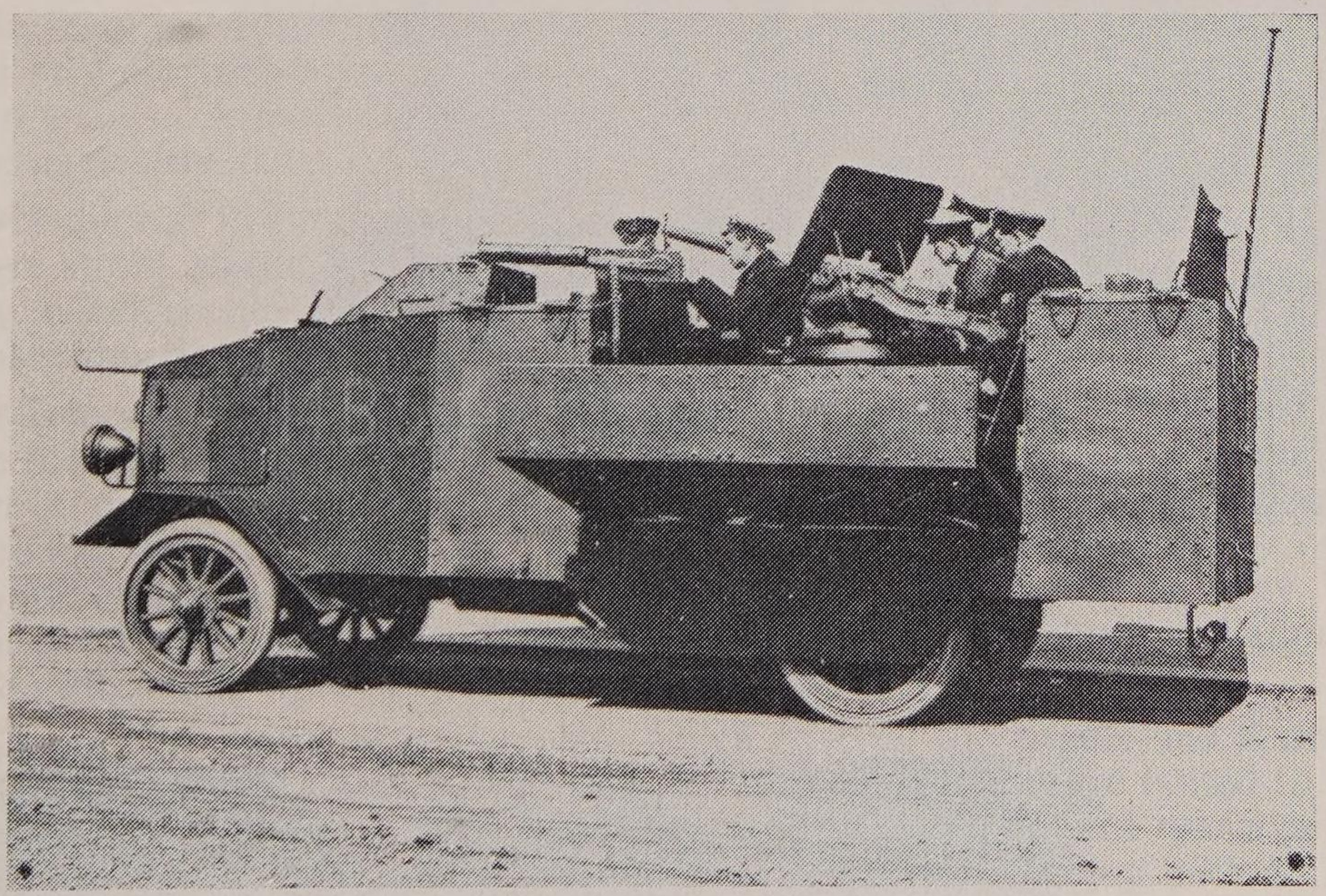

*Delauney-Belville*
*1915*

materials permitted these designs were improved firstly by building higher side armour but still with open tops and later enclosed bodies with small turrets. These vehicles were all produced between early September and December 1914 and it was not until December that the first three fully armoured Rolls Royce cars appeared with an all round traverse machine gun turret,

Similar bodies were also built on Talbot, Lanchester and Delauney-Belville chassis as well as that of the Silver Ghost.

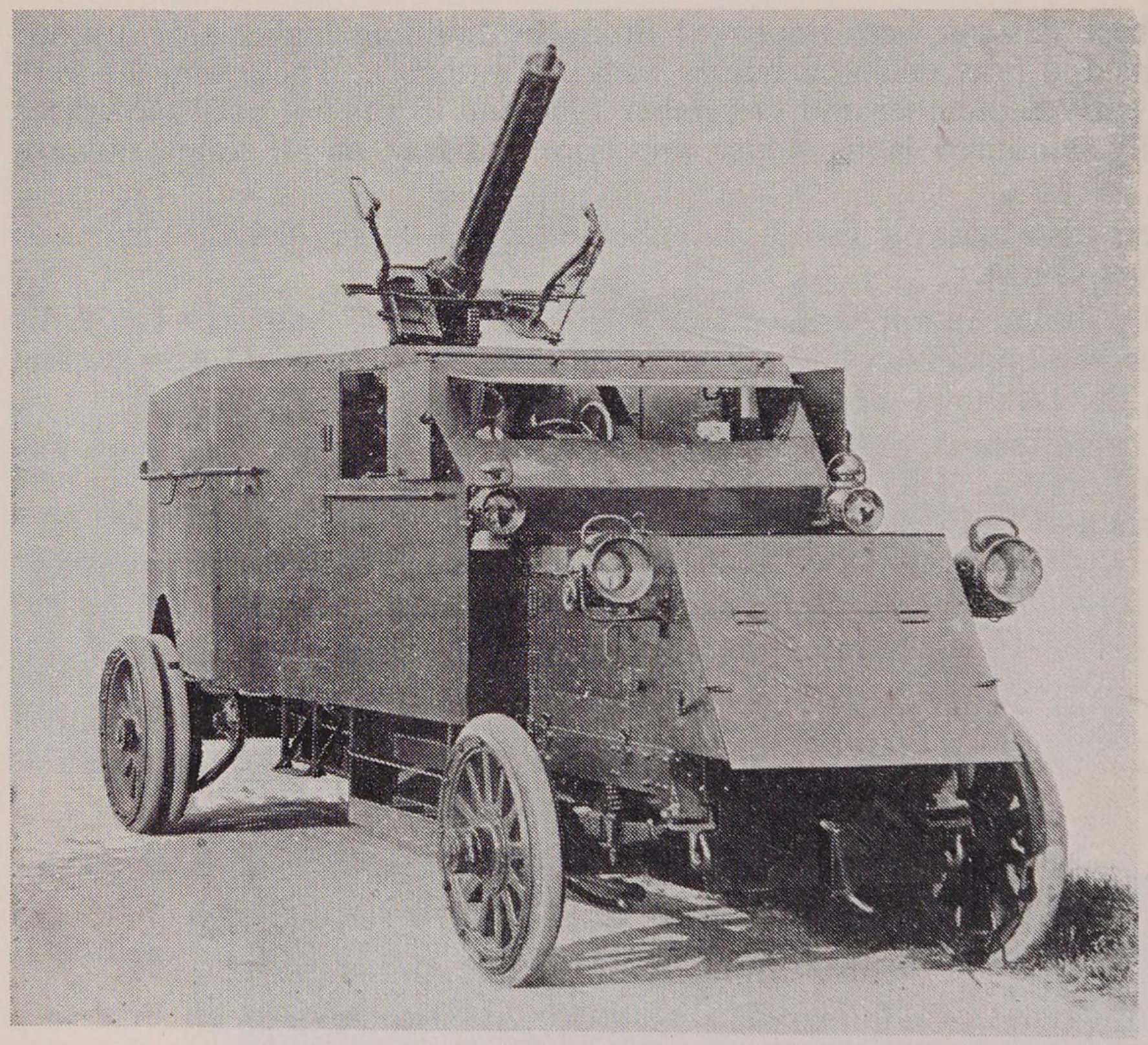
Although generally similar in appearance each had distinguishing features. The Rolls retained its classic lines, the Lanchester had a bevelled turret like the Rolls but with sloping frontal armour whilst the Delauney-Belville had a circular flat topped turret.

Initially the cars were armed with a single Maxim machine gun but later this was replaced by a .303-in. Vickers. They were also equipped with electric lighting, twin rear wheels, pneumatic tyres and had detachable running boards for obstacle crossing.



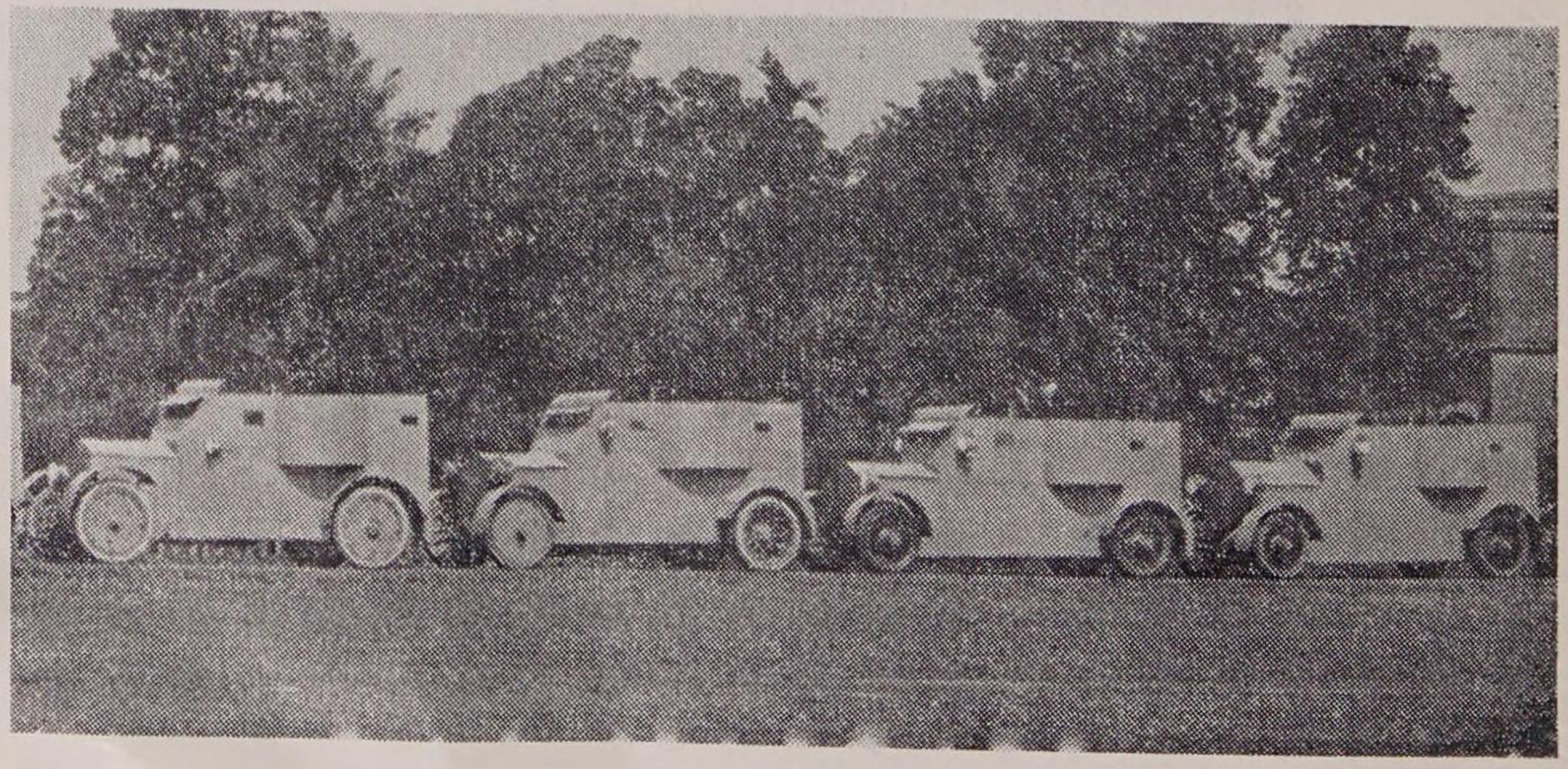
*Seabrooke Armoured Truck 1915*

While the armoured cars described were under construction, the Naval Brigade in Flanders foresaw the need for heavier vehicles and designs were put forward using the Seabrooke truck chassis. This made its appearance in February 1915. It was armed with a 3-pr. gun with shield and four Maxim machine guns and was manned by a crew of seven. The armour was 0.316-in. thick and hinged at either side to allow the armour to be swung down on cables when the gun was fired to either side. The vehicle was not a complete success since it suffered from frequent breakages of springs and back axle. Although these faults were not overcome the vehicle did some useful work around Ypres in early 1915.



*Peerless Armoured Lorry 1915-1916*

*Cars armoured in India 1915*



The Admiralty Air Department was responsible for this design. One of the first anti-aircraft cars appeared in 1915/16. This was an armoured lorry and was mounted on an imported American Peerless chassis. The armament was a 1-pr. pom-pom. The vehicle was chain driven and equipped with acetylene lighting and solid tyred artillery wheels.

The early onset of trench warfare in Western Europe put a stop to the use of armoured cars in France until 1918 when more fluid conditions of warfare again brought them into prominence and demand.

The armoured cars of the R.N.A.S. Squadrons were withdrawn and sent to the Middle East, leaving the stage clear for the appearance of the first fully tracked armoured fighting vehicles in 1916. In September 1915 all naval armoured cars were taken over by the Army with the exception of one squadron which was retained for experimental purposes and was to play an important part in the development of the tank.

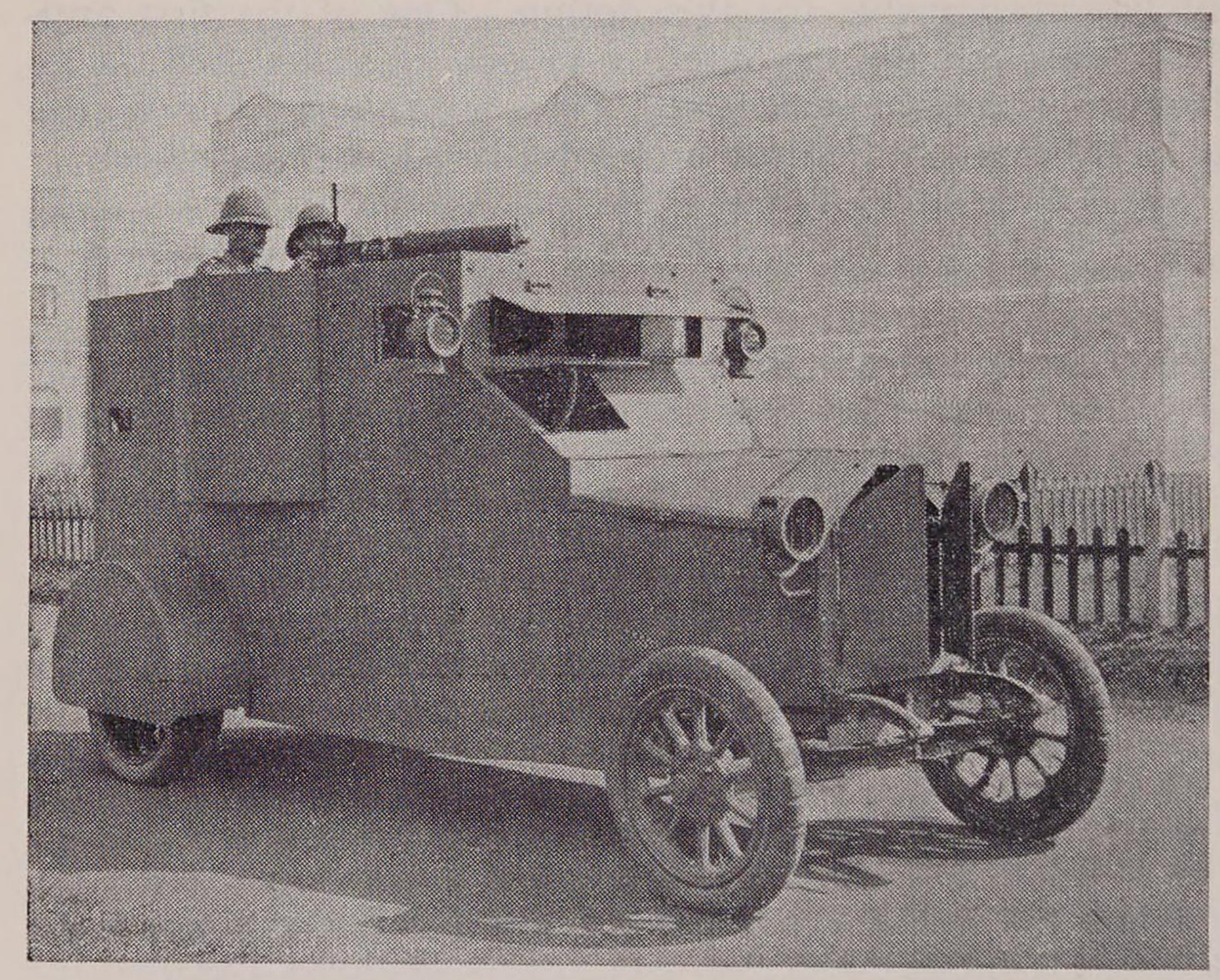
The armoured cars withdrawn from France were now to be used effectively in the Western Desert, Palestine and Iraq. An armoured car unit also operated in Southern Russia. In Iraq, in addition to the accepted roles of armoured cars, they were used as the spearhead of motorized columns whose other elements consisted of machine gunners and riflemen in trucks. A foretaste of the combination of mechanised units of all arms which were to be as decisive later on as had been the chariots of the Egyptians.

In 1914 the war in France caused the withdrawal of regular troops from India and this put a severe strain on the depleted local garrisons whose task was to maintain order in the face of the considerable opportunities now offered for taking advantages of this weakness by demonstrating against British rule.

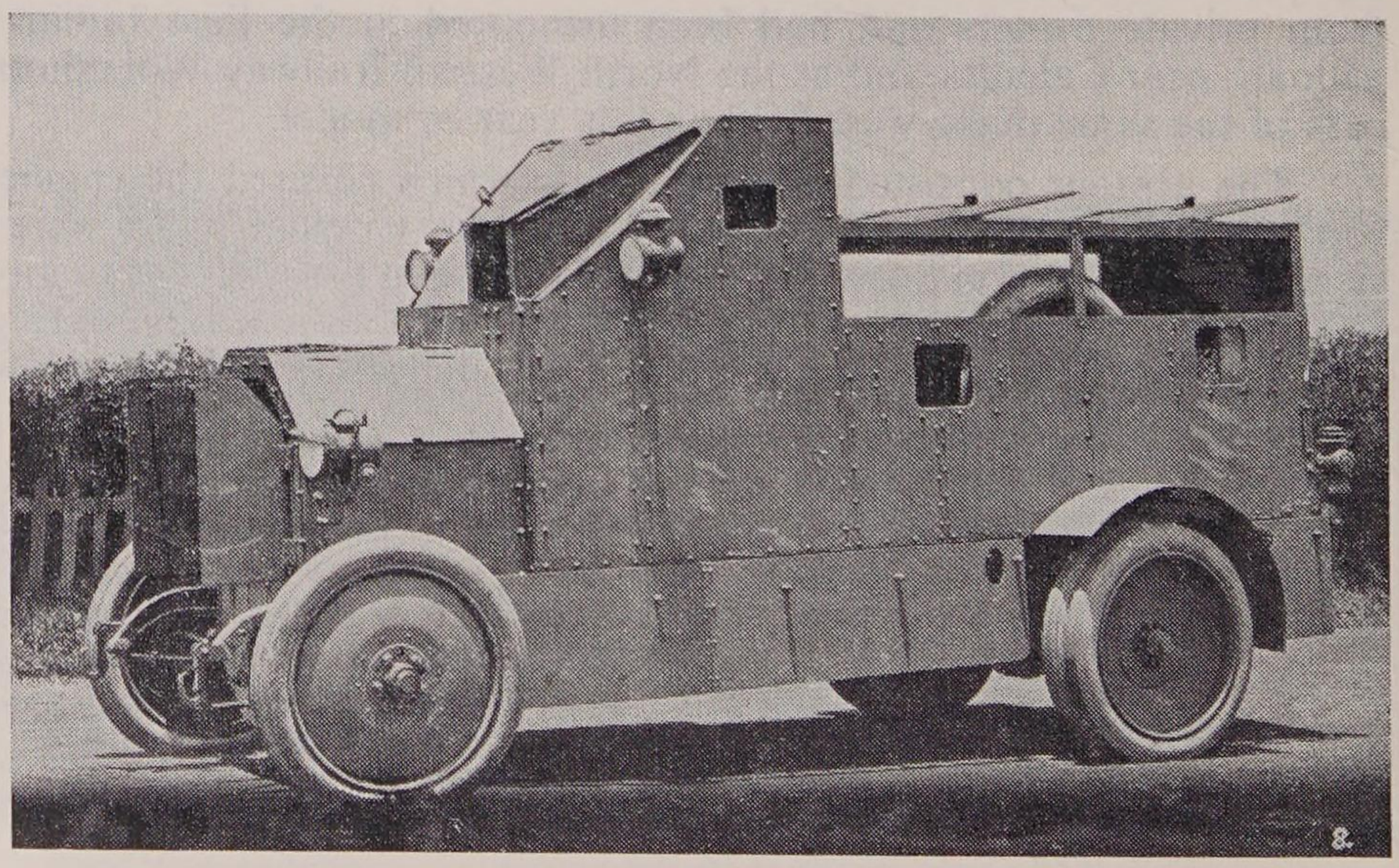
To relieve this situation, it was decided to form a number of armoured car units in India, the first making its appearance with the arrival at Peshawar of a number of cars. They were a miscellaneous collection and included three Rolls Royce, four Minervas, three Mercedes and two Daimlers. All were ex-touring cars presented by or purchased from private owners and had been armoured in the East Indian Railway Workshops, Lilloah, near Calcutta and at the North Western Railway Workshops at Lahore. No two cars of the same make were of the same year or model.

The armour consisted of boiler plate which covered the engine and formed an open top box body with sides about 3-ft. 6-in. high. Circular plates were bolted to the artillery type wheels. The armament was one machine gun for each car of any type available. Until the end of 1915 these were .450-in. Maxims with ammunition dating back to 1897, whilst the unit in Quetta was issued with a multi-barrelled Gatling, hopper fed and fired by a hand operated crank.

Sixteen other armoured car units were formed in India during 1915, some of which were equipped with Fiat armoured cars. These were 1 $\frac{1}{2}$ ton Fiat chassis fitted with armoured bodies to a War Office specification. The armour was Beardmore's special bullet proof plate 6 mm. thick. Each unit was allotted a local defence area, some on the North West Frontier and others in widely separated parts of the country. The vehicles were all of odd makes with improvised armoured bodies. Most of them were underpowered for the work they had to do but they were all that were available in the country at a time when it was not considered possible to ship vehicles to India sufficiently quickly to be of use.



*Standard 1915*
*The first car completed at Lillooah*

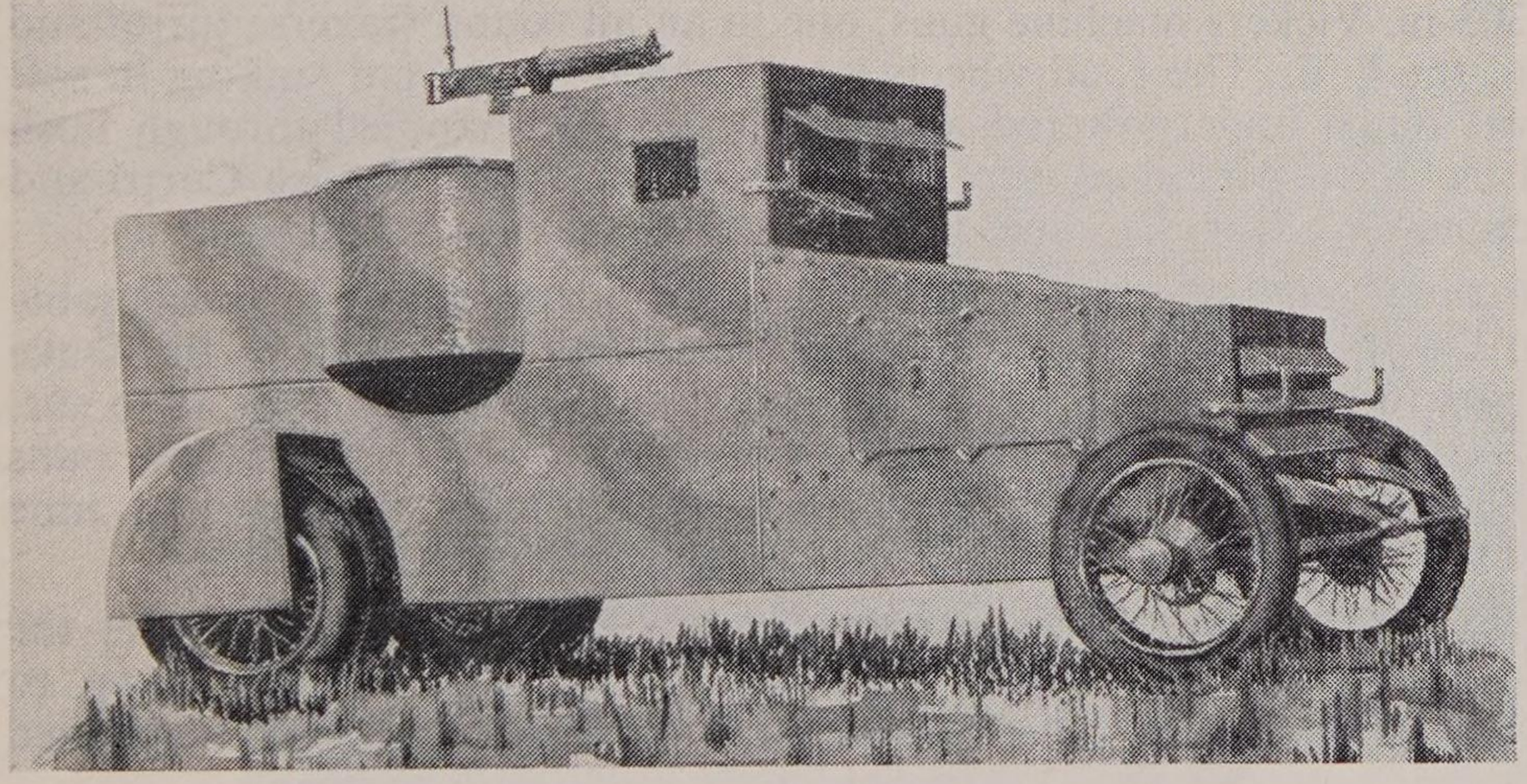


*Fiat 1915*

The history of one particular car of this period can be taken as typical of contemporaries of whatever make.

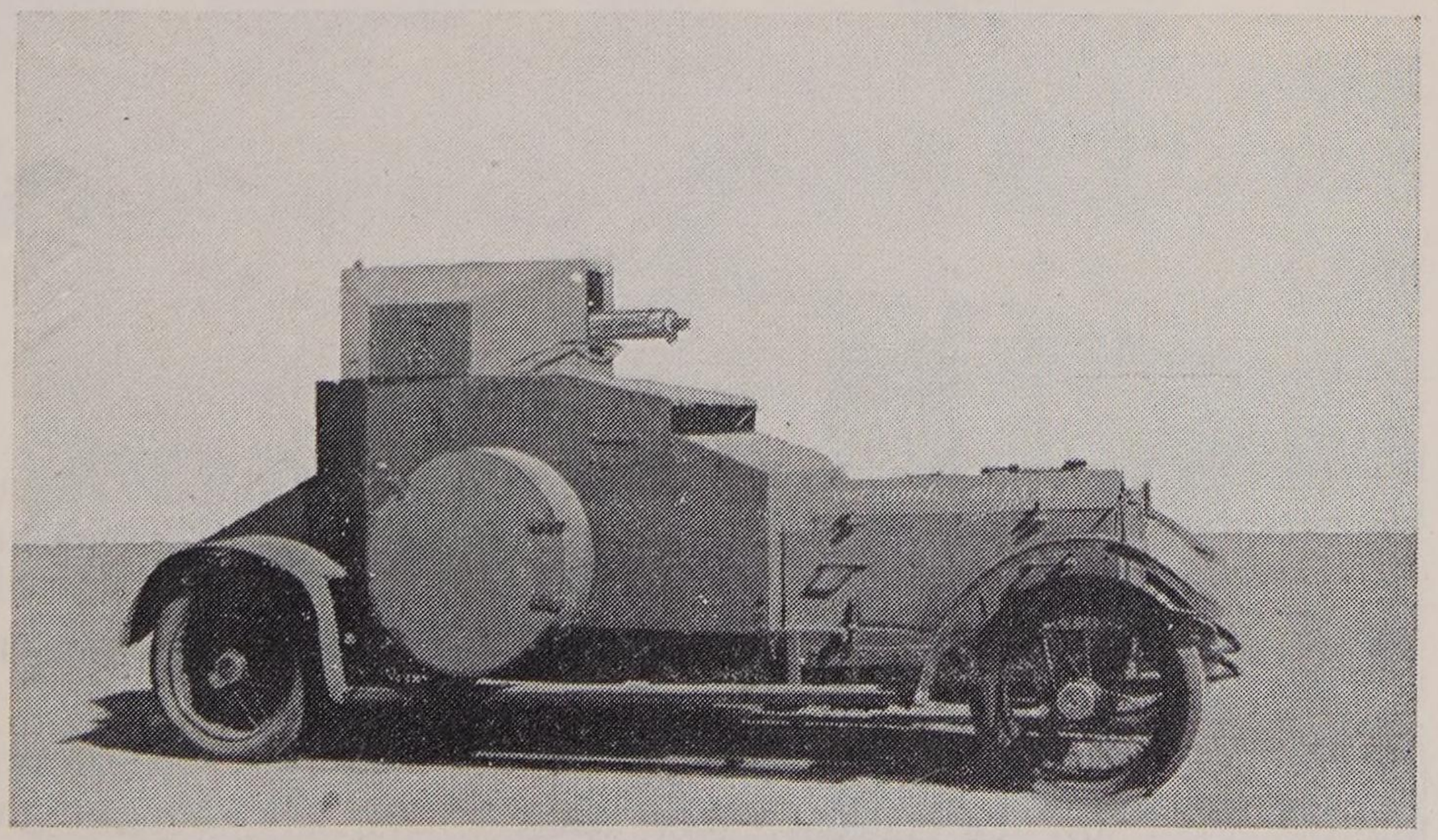
This was a Rolls Royce No. 2641, Silver Ghost standard 40/50 h.p. built in 1911. It belonged to the Rajah of Ticca who presented it to the Government at the beginning of the 1914 War. Between 1915 and 1919 it took part in internal security and frontier operations in the territories of Buner, Swat and Mohmand as well as in Wazeristan and Afghanistan.

At the end of 1919 No. 2641 was fitted with a new armoured body designed by the 1st (H.Q.) Armoured Motor Brigade and built by the Gun Carriage Factory at Jubbulpore.



*Rolls Royce Armoured Car No. 2641 1915*

*Wedding Bells 1919-1920*

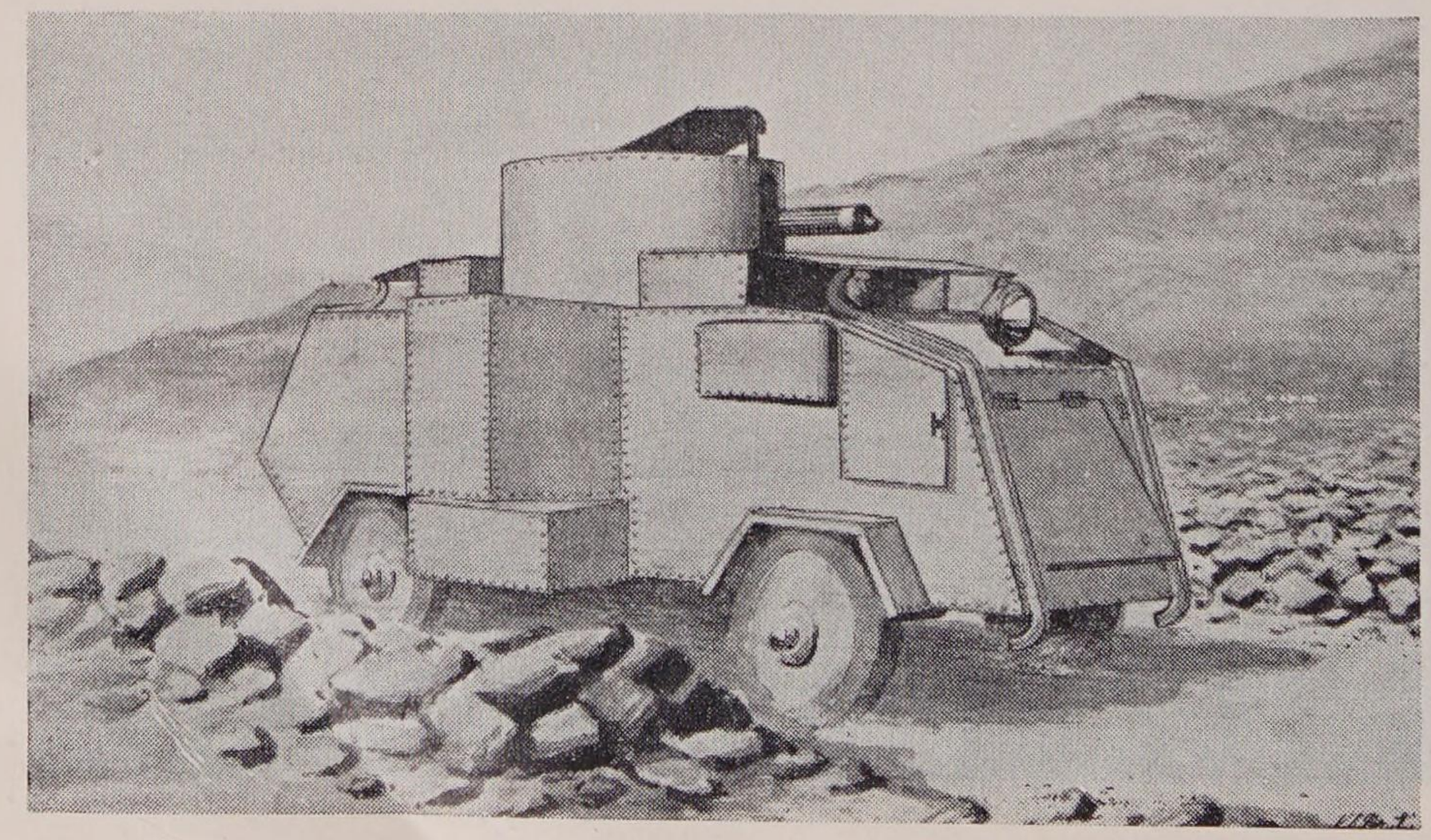


In 1920 the car was used as a bridal coach at the wedding of the then Adjutant of the 1st Brigade and thus acquired the name "Wedding Bells". Between 1921 and 1925 Wedding Bells served on the North West Frontier with its frequent alarms and excursions. Between 1927 and 1933 it saw service in Lahore, Delhi, Cawnpore and Bangalore on normal garrison duties of an internal security nature. From 1935-1940 it was stationed at the Armoured Training Centre at Ahmednagar. In 1940 the body was removed and the chassis used for instructional purposes. A memento of this veteran car exists in the form of a cigarette lighter made from the radiator plaque spark and throttle controls and ignition switch. This is now in the possession of the Royal Tank Regiment.

In 1915 the 1st Armoured Motor Battery was formed in England for service in German East Africa. The equipment was a Leyland 24 h.p. lorry chassis armoured by Beardmore and armed with two .303-in. Vickers machine guns, one in an all round traverse turret and the other in the rear of the hull. The road wheels were flanged to prevent sinking in soft going. The vehicle was much underpowered and had to be man-handled through bush country. Drivers and technical personnel were drawn from the Army Service Corps and gunners from the Machine Gun Corps. There were four Leyland cars in the battery.

In Egypt in 1916 the "Senussi" were in armed rebellion and causing considerable trouble in the Western Desert. Rolls Royce armoured cars under command of the Duke of Westminster took part in operations against the Senussi and on March 14th 1916 surprised and destroyed a large Turco-Senussi force of all arms equipped with machine guns and artillery. The Duke's force consisted of one Ford car mounting a machine gun, nine Rolls Royce armoured cars and one 1914 Rolls touring car which he drove himself.

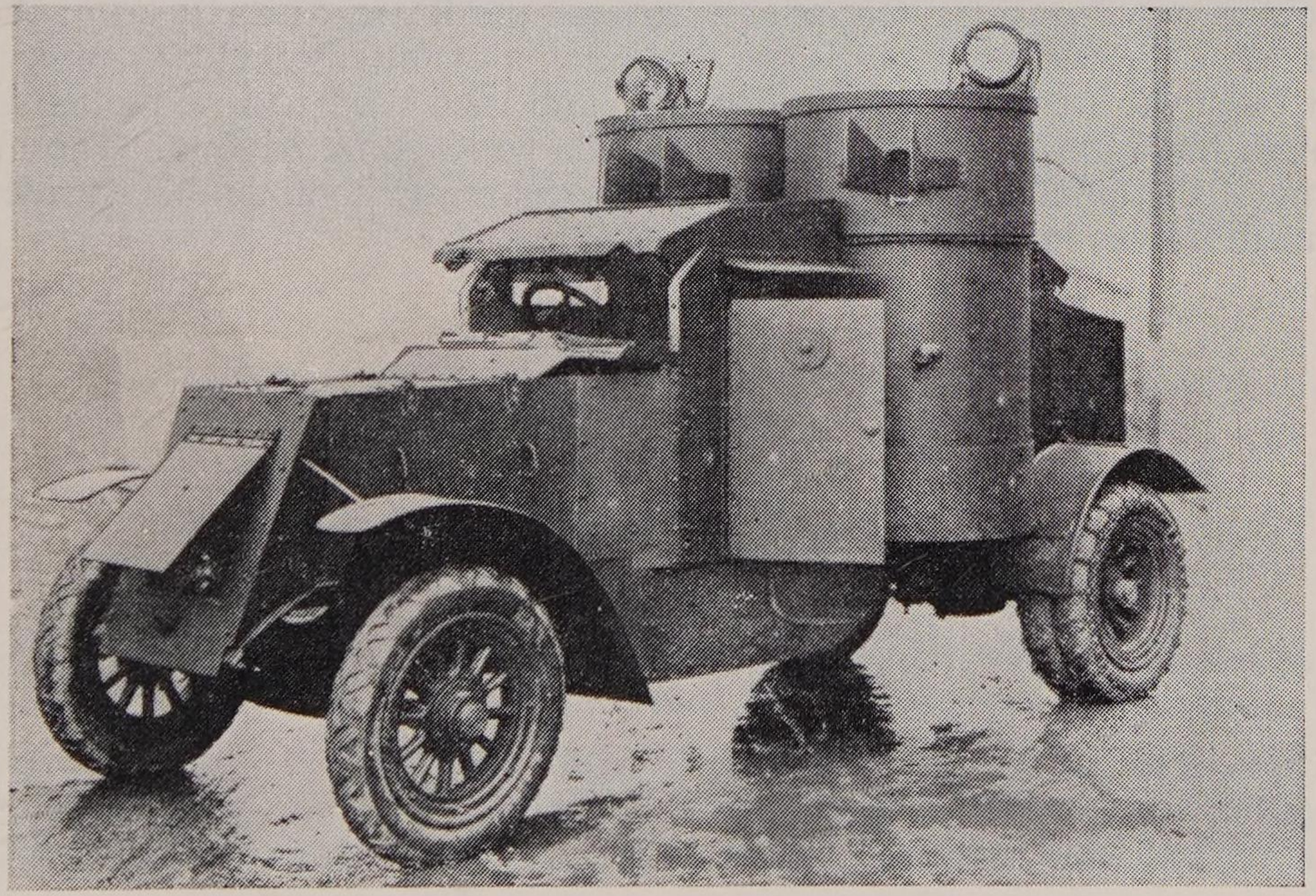
In these operations tremendous distances were covered and it was shortly after the Senussi defeat that the Duke made his historic dash to Bir Hakim, 200 miles away, to rescue the survivors of the ill-fated armed merchantman "Tara" which had been torpedoed



*Jeffery Quad*
*1917-1918*

a few miles west of Sollum Bay. For the remainder of the war armoured cars continued to patrol the Western Desert and ensure the safety of the Nile Valley.

In late 1917 Jeffery Quad Armoured Cars were purchased from America for use in India as replacements for the improvised cars already described. This car weighed 6.5 tons, was powered by 40 h.p. Buda engine and had a top speed of 20 m.p.h. on roads. Steering was on all four wheels which had solid tyres and duplicate steering controls at the rear. The armament was a .303-in. machine gun in a flat top, all round traverse turret. These vehicles were first used by the 10th Armoured Motor Brigade and were found insufficiently robust to meet the conditions on the North West Frontier. However despite a shortage of spares, cars were kept on the road by cannibalisation and remained in service until 1924.



*Austin 1917*

Armoured cars based on the Austin lorry chassis had been built in England and supplied to the Russian Army from 1915 onwards. In 1917 this same design was used by the British Army but by then had been fitted with duplicate steering controls in rear.

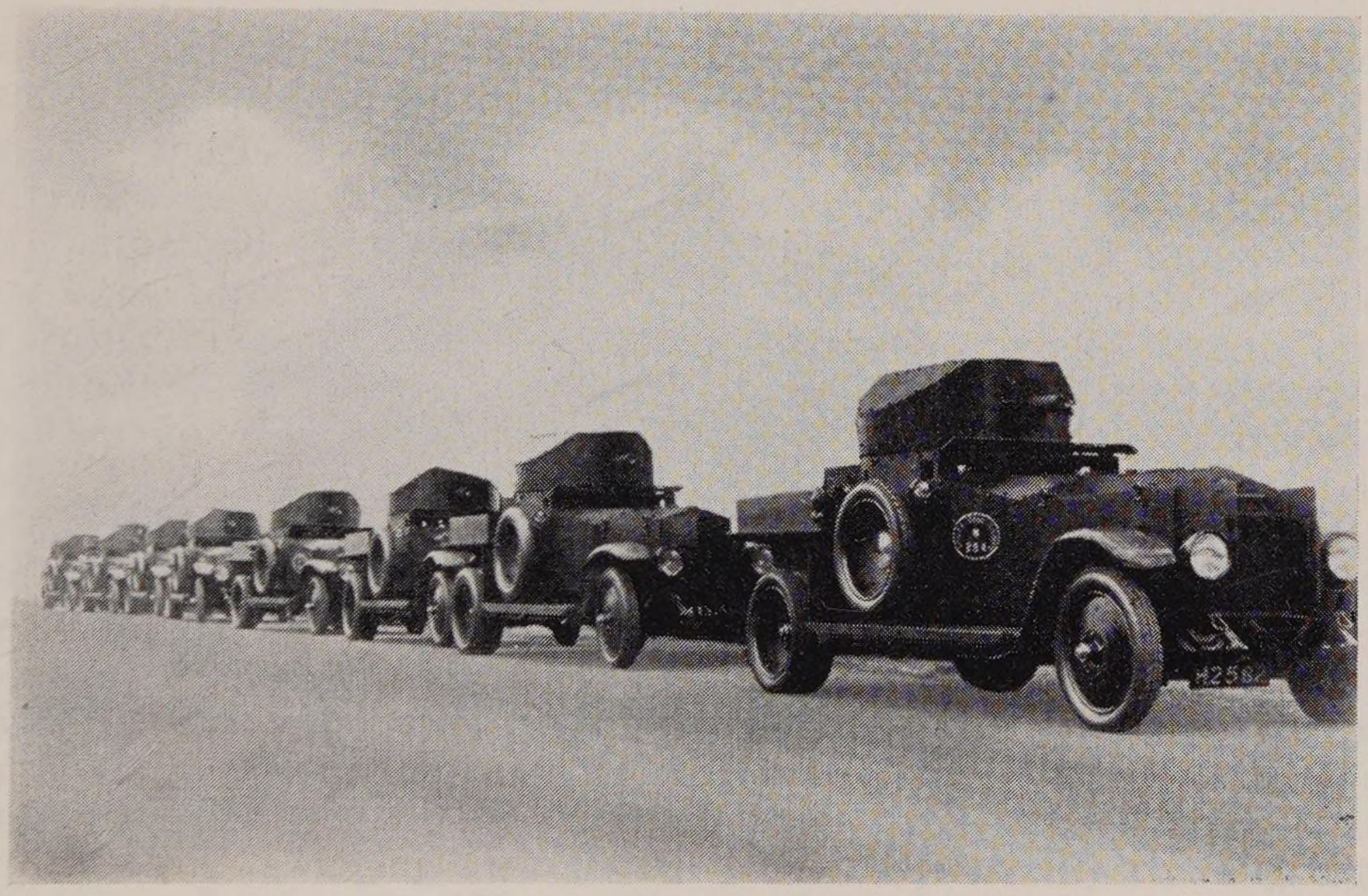
However, unlike the Jeffery, there was only one reverse gear and steering was still on the front wheels only. The vehicles could not therefore be regarded as "double-ended".

The Austin car was 16-ft. long, 6-ft. 7-in. wide and 7-ft. 10-in. high. At a weight of 4.14 tons the 50 h.p. engine gave a top road speed of 30-35 m.p.h. The car had two circular

flat topped turrets each mounting a Vickers machine gun, and was fitted with pneumatic tyres and 108 mm. armour. By 1918 Allied operations in Europe had resulted in more open and mobile conditions which favoured the use of armoured cars and on April 18th of that year the 17th Tank (Armoured Car) Battalion, Tank Corps was formed. Sixteen Austin armoured cars destined for the East were unloaded from the docks at Cardiff and entrained for Bulford in Wiltshire.

Here their Vickers guns were exchanged for the Hotchkiss used by the Tank Corps and by 28th April the Battalion was in France.

In the ensuing operations the value of the rotating turret and the depression obtained with the ball type gun mountings was proved in action. These cars penetrated the enemy lines at Villers Bretonneux on August 8th to a depth of about 8 miles and did considerable damage in his rear areas. On the 11th November they were operating as the spearhead of the advance and on the 6th December they crossed the Rhine at the head of the Army of Occupation. The technique developed at this time is of interest. Heavy tanks were used to break through the trenches and barbed wire and then used to tow the cars across the broken ground until they could be loosed into the good going beyond. The moral effect on the enemy of these machines moving fast and apparently invulnerable astride their lines of communication was incalculable.



*Rolls Royce 1920*

## BETWEEN THE WARS

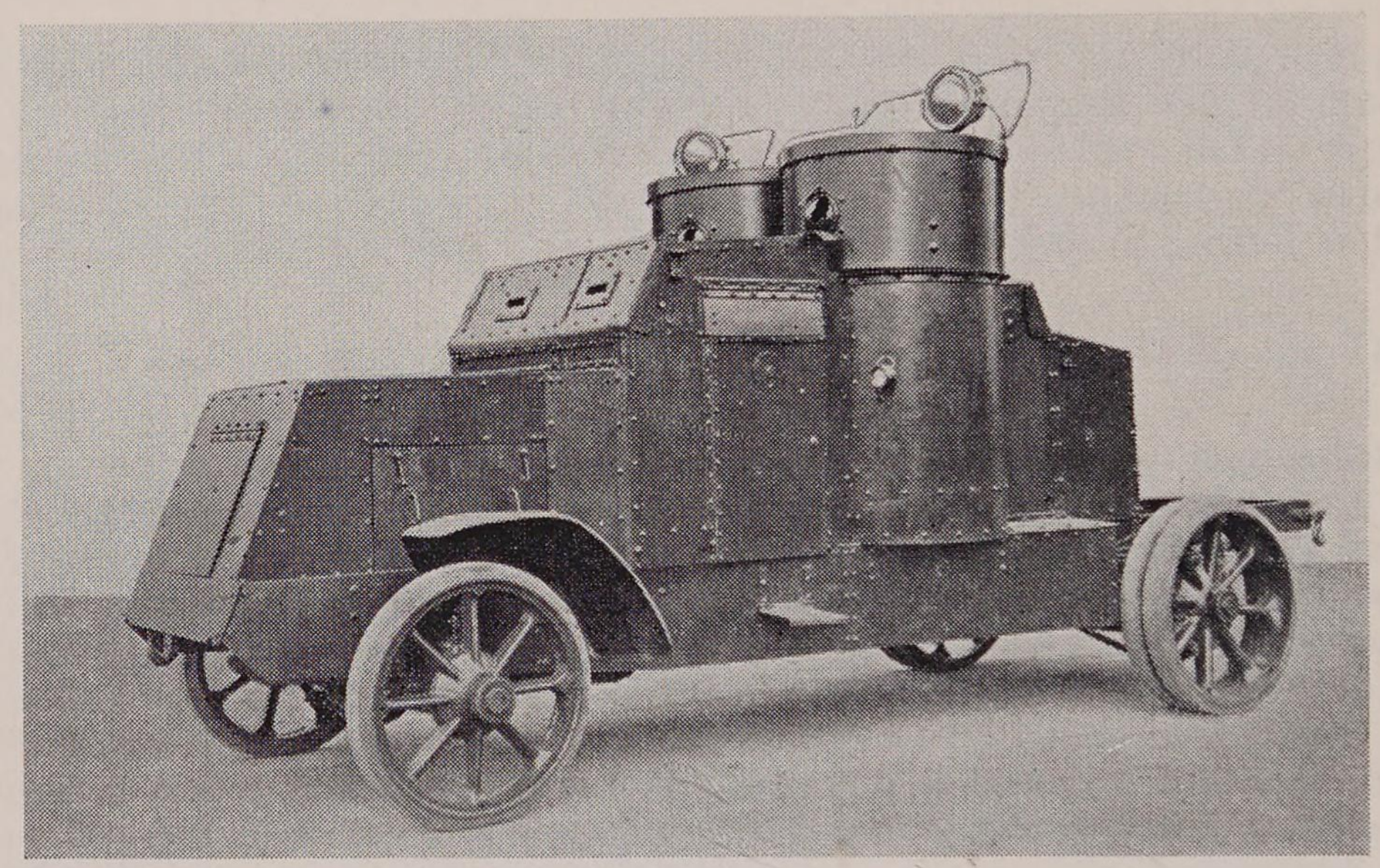
The successful employment of armoured cars in the first war established their military advantages and gained them a permanent place in the post war organisation.

The role envisaged for British armoured cars was that of medium and long range reconnaissance but between 1919 and 1939 they were mostly needed and employed in areas with internal security problems such as India, Egypt, Palestine, Iraq and Ireland.

For this reason development tended to meet the special requirements of these countries whilst financial stringency demanded the use of adapted commercial and lorry chassis rather than specially designed and developed vehicles.

When the third Afghan War broke out in 1919 the 1st Armoured Motor Brigade in India was still equipped with the 1914 turretted pattern Rolls Royce and Jeffery Quads and the latter were also still the equipment of the 10th Armoured Brigade. Both formations did excellent work with these old machines during the Afghan and Waziristan Campaigns.

In Ireland the 17th Tank (Armoured Car) Battalion, sent there for internal security, escort and patrol duties in 1919, was replaced by the 5th Armoured Car Company, R.T.C. in 1920. This company initially took over the wartime Austin cars but was also reinforced with some heavy tanks.



*Peerless 1919*

During 1919-1920, however, a Peerless armoured car and another Rolls Royce were introduced. The Peerless was built on a 3 ton lorry chassis similar to the 1914 type but strengthened to carry extra weight. It also had the same solid tyres and chain drive. The armoured body was similar in general design to the Austin with twin turrets but it was slower and heavier having a road speed of only 12 m.p.h. The engine was of 40 h.p. and with an armour basis of 8 mm. the car weighed 5.8 tons. Its length was 20-ft. 2-in., width 7-ft. 4-in. and height 9-ft. 1-in. The 1920 Rolls Royce Mark I cars had the same chassis as the 1914 pattern but had several improvements incorporated. These included disc wheels, twin at the rear. The suspension was semi-elliptic in front and full cantilever at the rear. augmented by friction disc type shock absorbers. The hull was of 10 mm. plate with a protective bulk head between the engine and crew compartment. The circular, full traverse turret with a fork mounted .303-in. Vickers machine gun was hand rotated. Observation was obtained through a flap in the roof and rear of the turret as well as through the gun port. Vision was therefore limited and protection for the gunner poor. Later versions partially overcame these defects by armouring the gun jacket, fitting protective armour over the gun port itself and the provision of more vision slits. In its final form it was further improved by the fitting of a turret cupola and ball mounting for the gun. A double leaf V door at the rear of the fighting cab provided the only means of entry and exit. Behind this door was a wooden platform which extended over the back axle and whose sides formed tool and kit boxes. The engine was protected by detachable plates and the radiator by two moveable plate doors controlled from the driving seat.

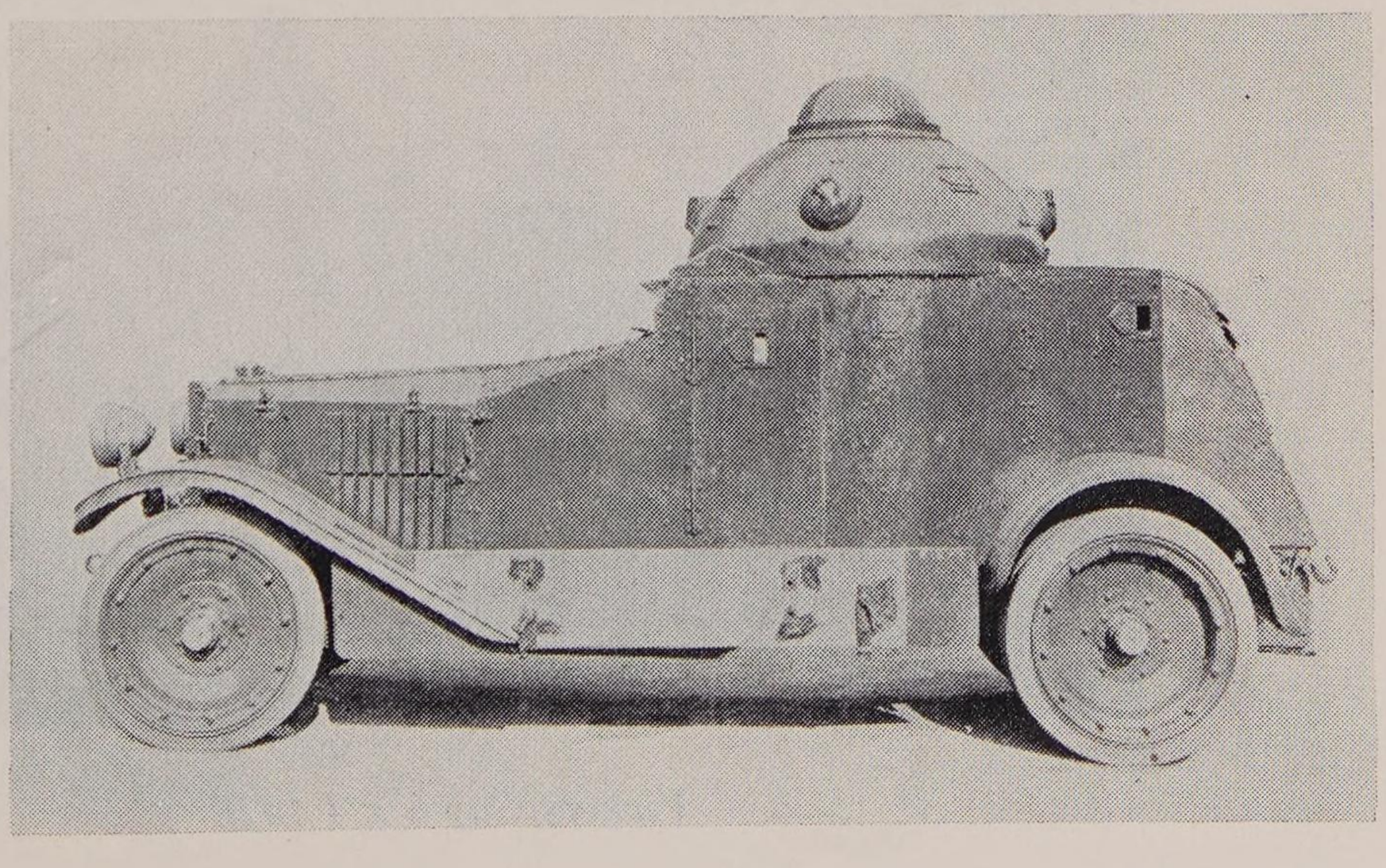
By the end of 1920 the 5th Armoured Car Company had been re-equipped with Peerless cars and in 1921 the 3rd Tank Battalion, then in Ireland, with the 1920 pattern Rolls Royce.

Both in 1921 and 1926 Armoured Car Companies of the Tank Corps were called out in aid of the Civil Power together with other troops during the general strikes of those years. Also in 1921 Armoured Cars helped to make history in Iraq. An armoured force of five Rolls Royce Cars, three Fiat 15 cwt. lorries, three Crossley tenders and one Vauxhall touring car carried out an experimental march lasting three weeks. One of the armoured cars was equipped with wireless and one of the tenders carried a ground wireless station. For 17 days this force was maintained in the desert completely severed from a fixed base of operations. All movement, supplies and orders were effected by wireless and air supply direct from the R.A.F. Station, Baghdad. The successful results of this trial had considerable influence on the development of wireless for use with armoured fighting vehicles.

During 1921 the Indian Government ordered a number of armoured cars to their own design. The first of these was a 1920 Rolls Royce chassis strengthened to carry additional weight. The hull was constructed of improved armour plate and rivetted but there was no platform at the rear as on the U.K. pattern. Instead the hull armour was extended over the back axle to provide extra space for the crew, ammunition and stowage. It had a dome shaped turret with a "swinging" traverse and an independently rotating hemispherical cupola with protected vision slits. There were four ball type machine gun mountings in this turret which could be closed by an armoured flap.

Normal practise was to mount either two machine guns facing forward or one forward and one to the rear on opposite sides of the turret. The guns used were Vickers .303-in. Mark 1 for which about 5,000 rounds each were carried.

The hull was lined throughout with woven asbestos designed to insulate the interior in hot climates. The car had disc wheels, twin at the back, fitted with semi-solid tyres. The general appearance of this car was similar to that of the Crossley 4 × 2

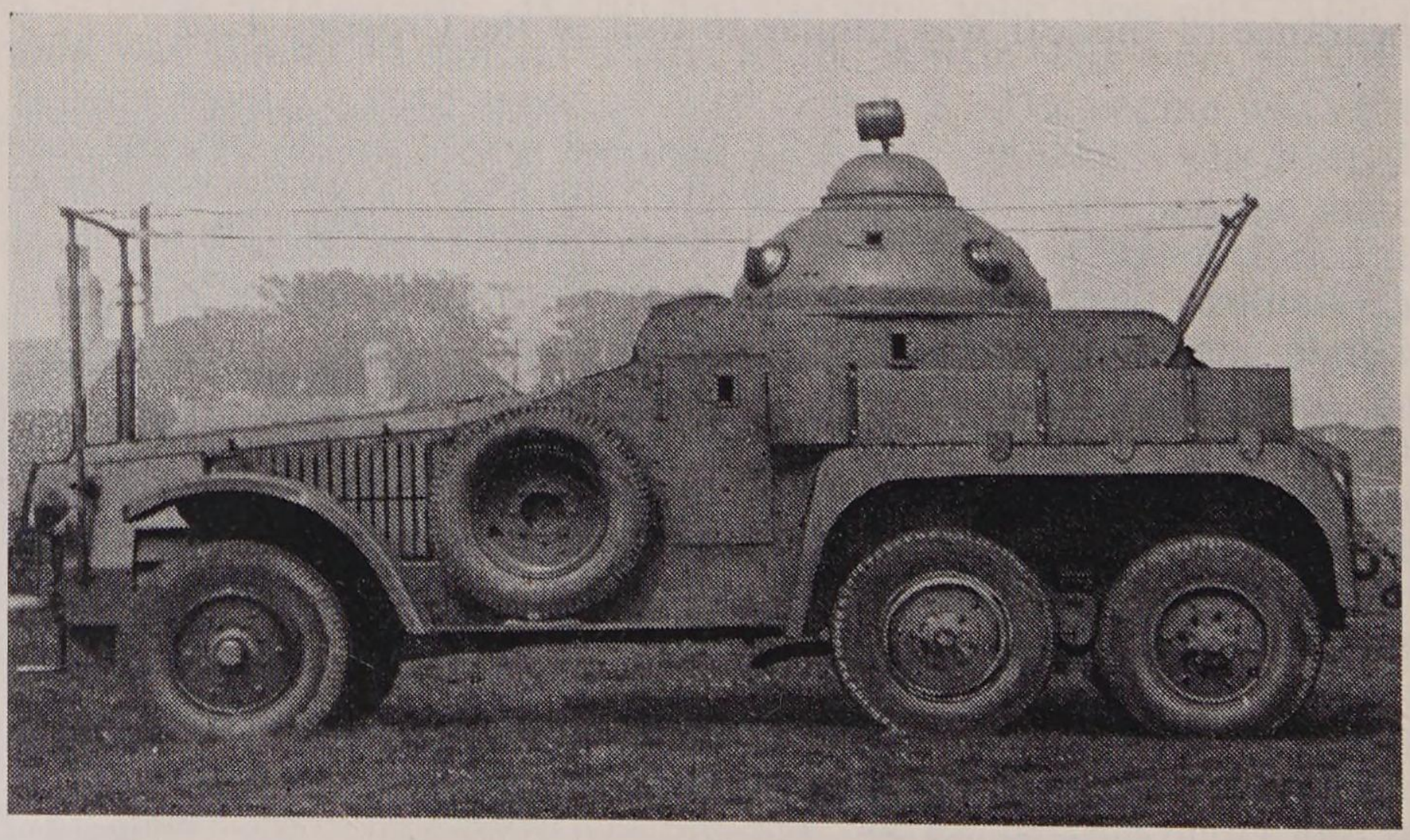


*Crossley 4 x 2*
*1923-1925*

In 1923 a similar design of hull was put on a Crossley truck type chassis powered by a 6 cylinder 50 h.p. engine with magneto ignition and antovac fuel system. There were three variations in hull details for these cars. These were comparatively minor and concerned the location and type of radiator louvres, types of gun mounting control and operating gear and the location of the detachable running boards. For internal security work the hull could be electrified by means of a dashboard control. The Crossley had a road speed of up to 40 m.p.h. but, as on many cars of this period, the foot brake acted on the transmission and was liable to cause skidding. The handbrake acted on the rear wheels and this was normally used and the footbrake only in an emergency. The Crossley was in service in India (before partition) for nearly 16 years with Royal Tank Corps Armoured Car Companies. Both the Rolls and Crossley were withdrawn from service in 1939 but the Crossley armoured hulls were re-fitted on a Chevrolet, 6 cylinder, truck type chassis by the Indian Government. This car had hydraulic brakes and heavy duty pneumatic tyres instead of the semi-solid type on the Crossley. The Museum exhibit of a Crossley 4 x 2 hull is an example of this hybrid arrangement.

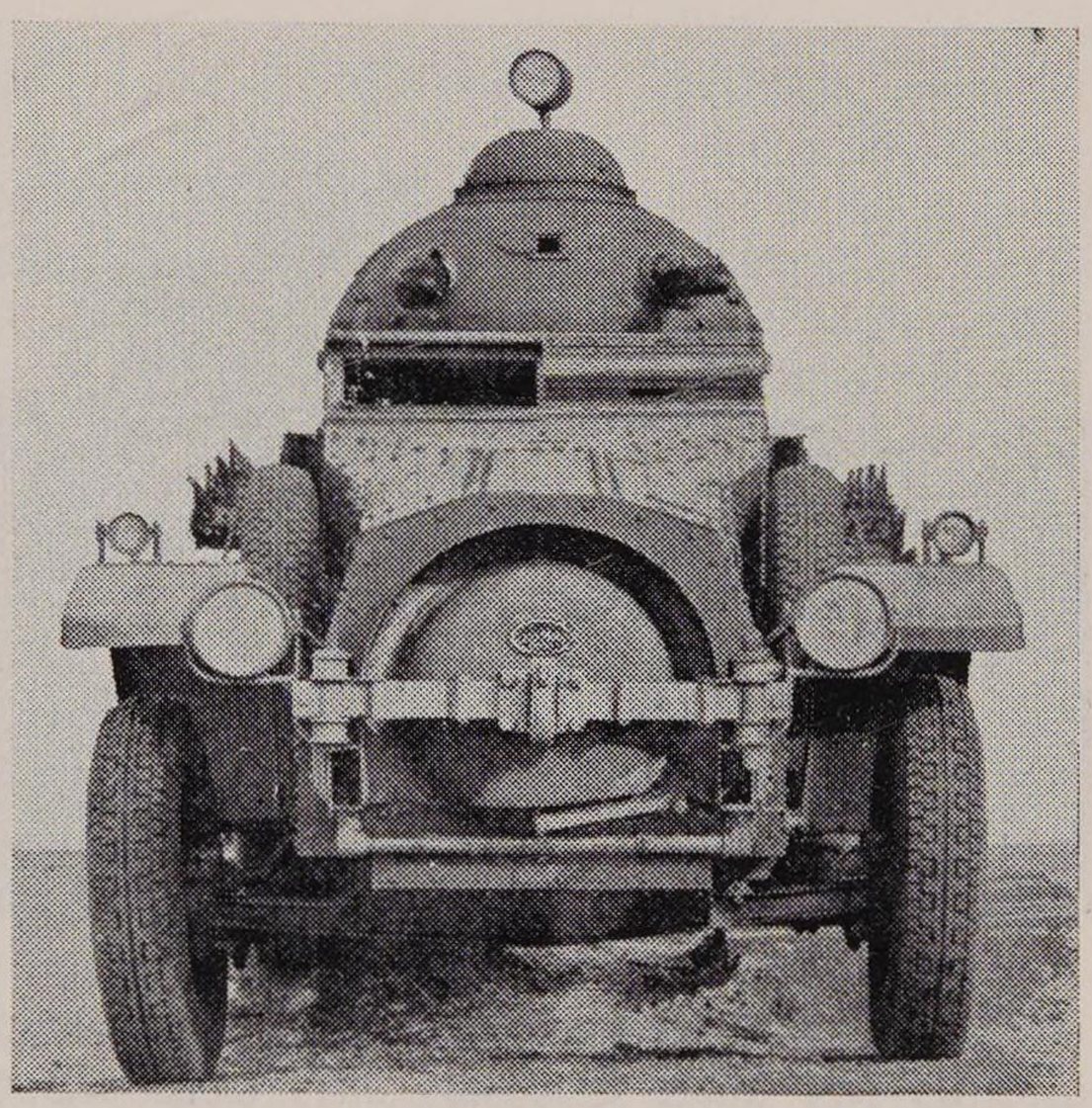
To improve the cross country ability of armoured cars interest now centred on the development of commercial type rigid 6 wheel vehicles with two driven rear axles. Improved pneumatic tyres and detachable light metal tracks, which could be fitted over the rear wheels, were also used to give added performance.

The first of this type again ordered by the Indian Government, was the 9 ton Guy armoured car on a 6 x 4 chassis powered by a 6 cylinder engine of 120 b.h.p. The armoured body was to the design and production of Vickers Ltd. and was similar in general to that of the Crossley but much bigger.



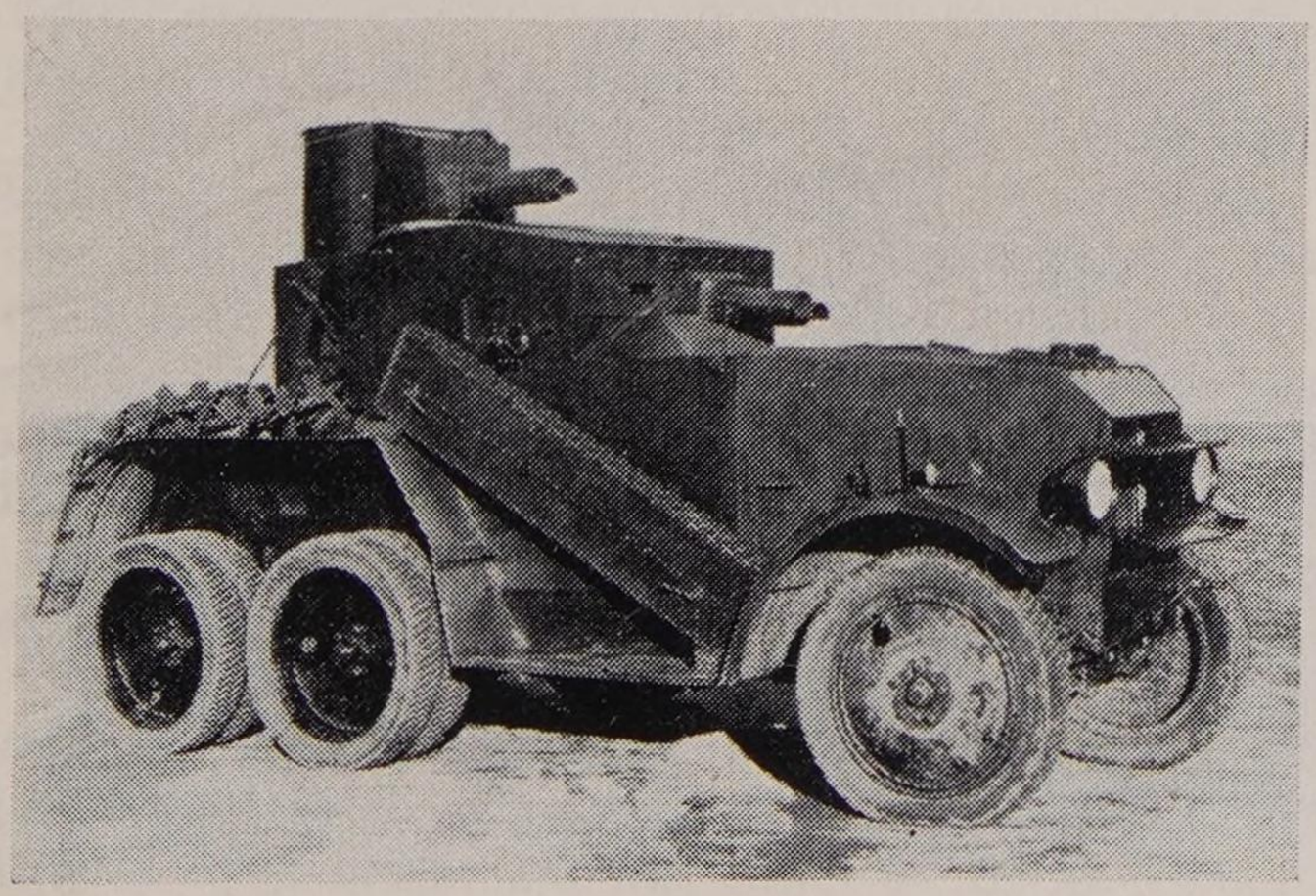
*Vickers/Guy 6 x 4 1928*

*Vickers/Guy 6 x 4*
*1928*

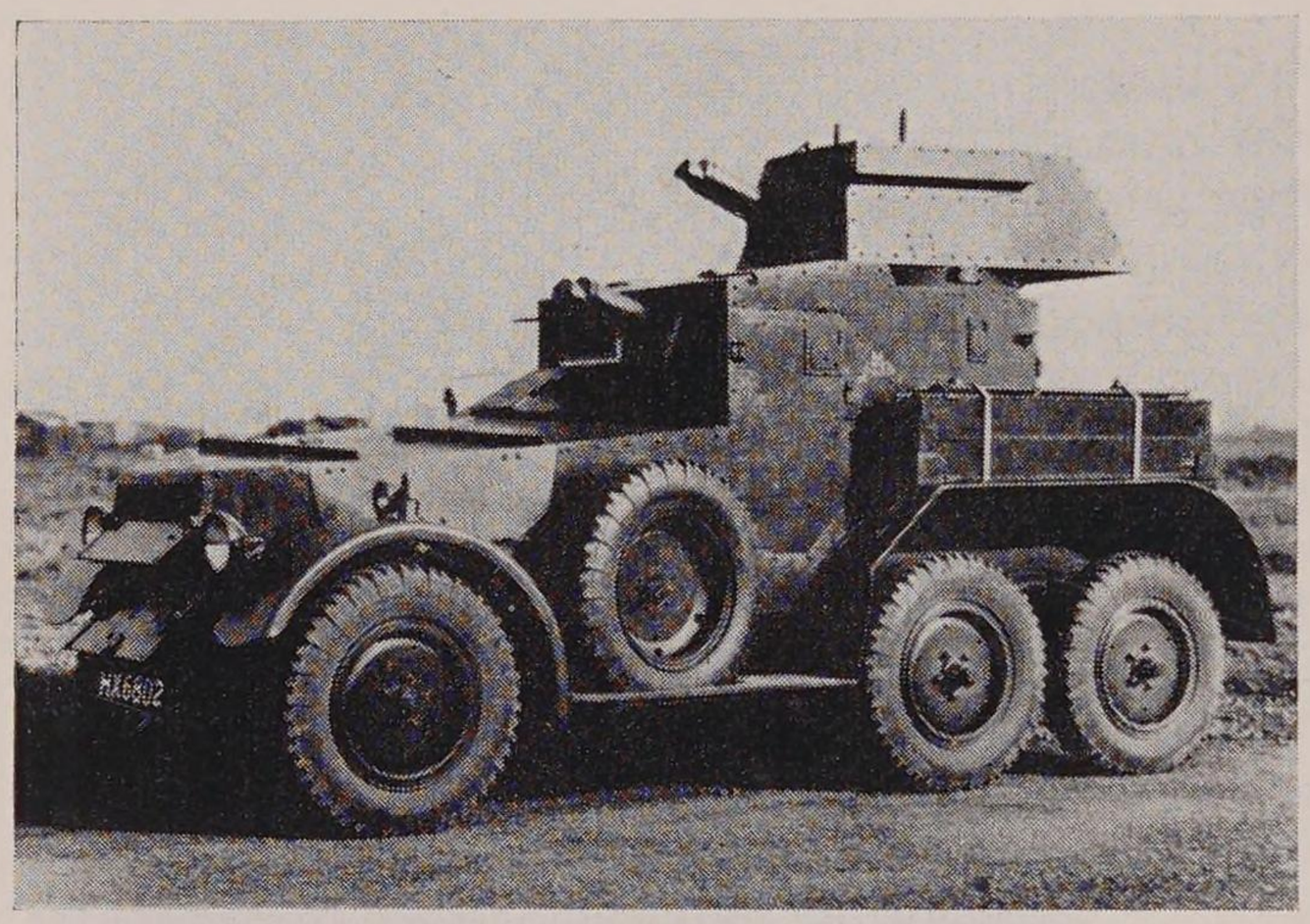


The Vickers/Guy was first used by the 10th Armoured Car Company, R.T.C. in 1928.

Some of these cars were fitted with wireless and external aerials as shown. With detachable tracks they had a good cross country performance and on roads a top speed of 40 m.p.h. They were, however, uneconomical and also far too heavy and cumbersome for use on the narrow winding tracks and khud roads of the North West Frontier with their weak bridges and culverts. They were withdrawn from service in 1934.



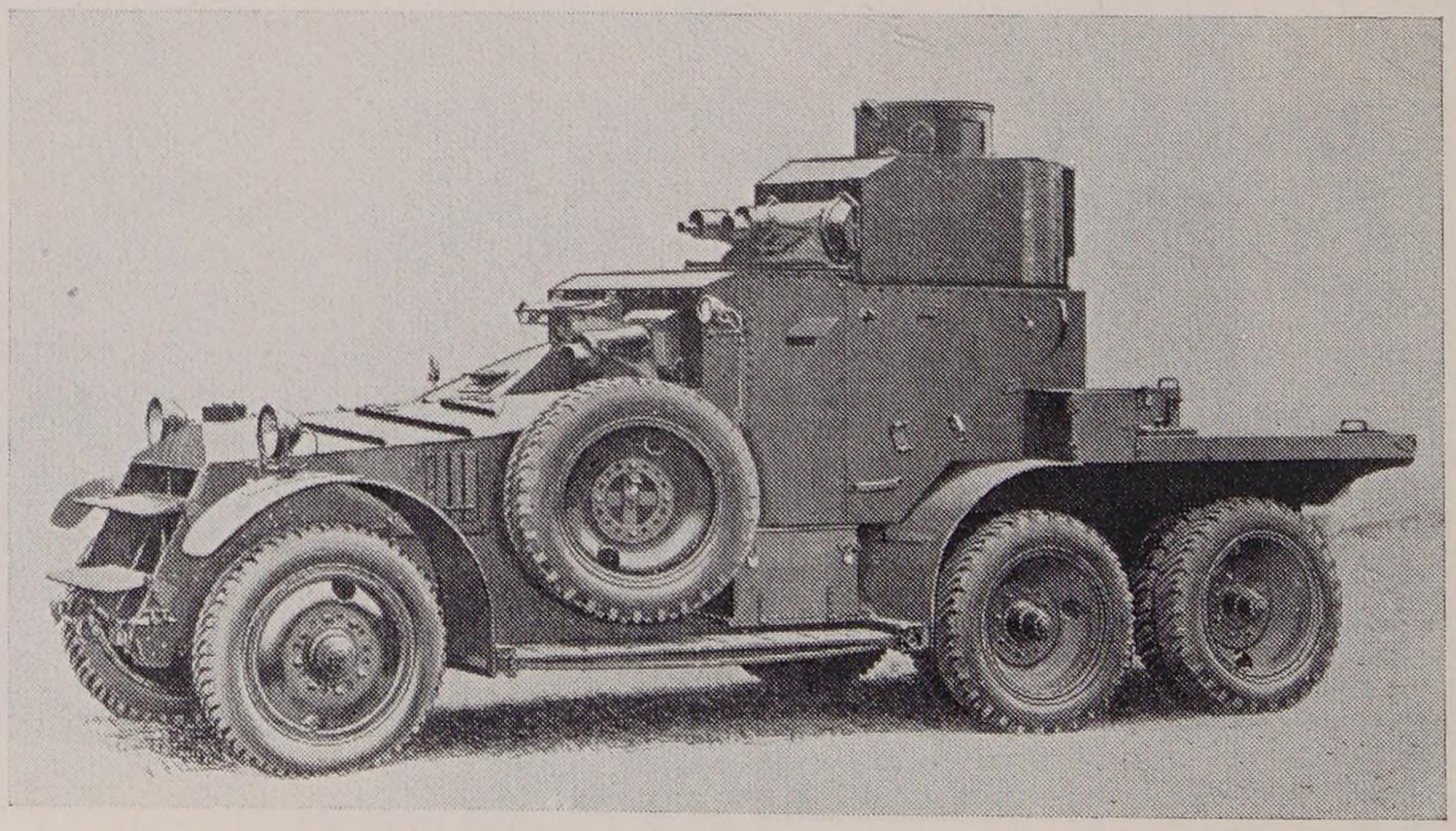
*Experimental Crossley*
*6 x 4 D2E1 1928*



*Crossley 6 x 4*
*1932*

In 1930 two experimental Crossley 6 x 4 cars, D2E1 and 2, were produced and subsequently five more Crossley cars were ordered. Some had dome and circular type turrets instead of the light tank type finally used and were tested between 1930 and 1935, some by Armoured Car Companies in India and some by the R.A.F. in Iraq.

There were also variations in the type of light tank turret used and the addition of a second machine gun beside the driver. The, by now, standard .303-in. Vickers machine gun was used. Other variations were in the stowed position of the detachable running boards and tracks which finally ended up on opposite sides over the rear twin wheel axles. In the production models the twin type rear wheels of D2E1 were discarded for a single wheel arrangement. Their performance was generally similar to the Guy with a road speed of about 45 m.p.h. at a total weight of about 6.5 tons.



*Lanchester 6 x 4*
*1931*

In 1931 another of the 6 x 4 type was issued to the 11th Hussars. This was the Lanchester, designed in 1929 and incorporating many improvements from past experience. It was the first British car to have a geared traverse. The armament was twin light tank type .303 and .5-in. Vickers machine guns, with a telescopic sight in the turret and a third machine gun, also with a telescopic sight, mounted beside the driver. The 6 cylinder engine developed 88 b.h.p. at 2,200 r.p.m. and gave a road speed of 45 m.p.h. The drive was taken from the engine through a main epicyclic and auxiliary crash type gearbox. The chassis frame was of bullet proof steel as were also the channel frames and tubes. The rearmost transverse tube was 10-in. in diameter and formed the emergency reserve fuel tank. Petrol feed was by Autovac. The brakes were servo operated hydraulic on all four wheels using the footbrake and direct operation using the handbrake. The armoured body bore a general resemblance to previous designs but had many improved features. Amongst these were quick closing revolver and observation ports, driver's safety glass screen, steel deflection plates on the hull front rotating commander's platform and 10 mm. armour on vertical plates. The 12th Royal Lancers were equipped with these cars when they were sent to the Saar in 1934. They were also used by the armoured car companies of the Selangor and Perak Battalions of the Federated Malay States Volunteer Force from 1938-1942 and the Singapore Volunteer Corps Armoured Car Company. They were used during the Malayan Campaign of 1941-42.

The main disadvantages of these 6 x 4 vehicles were that they were large, and had long bonnets which reduced the driver's visibility, with no front wheel drive and a low ground clearance.

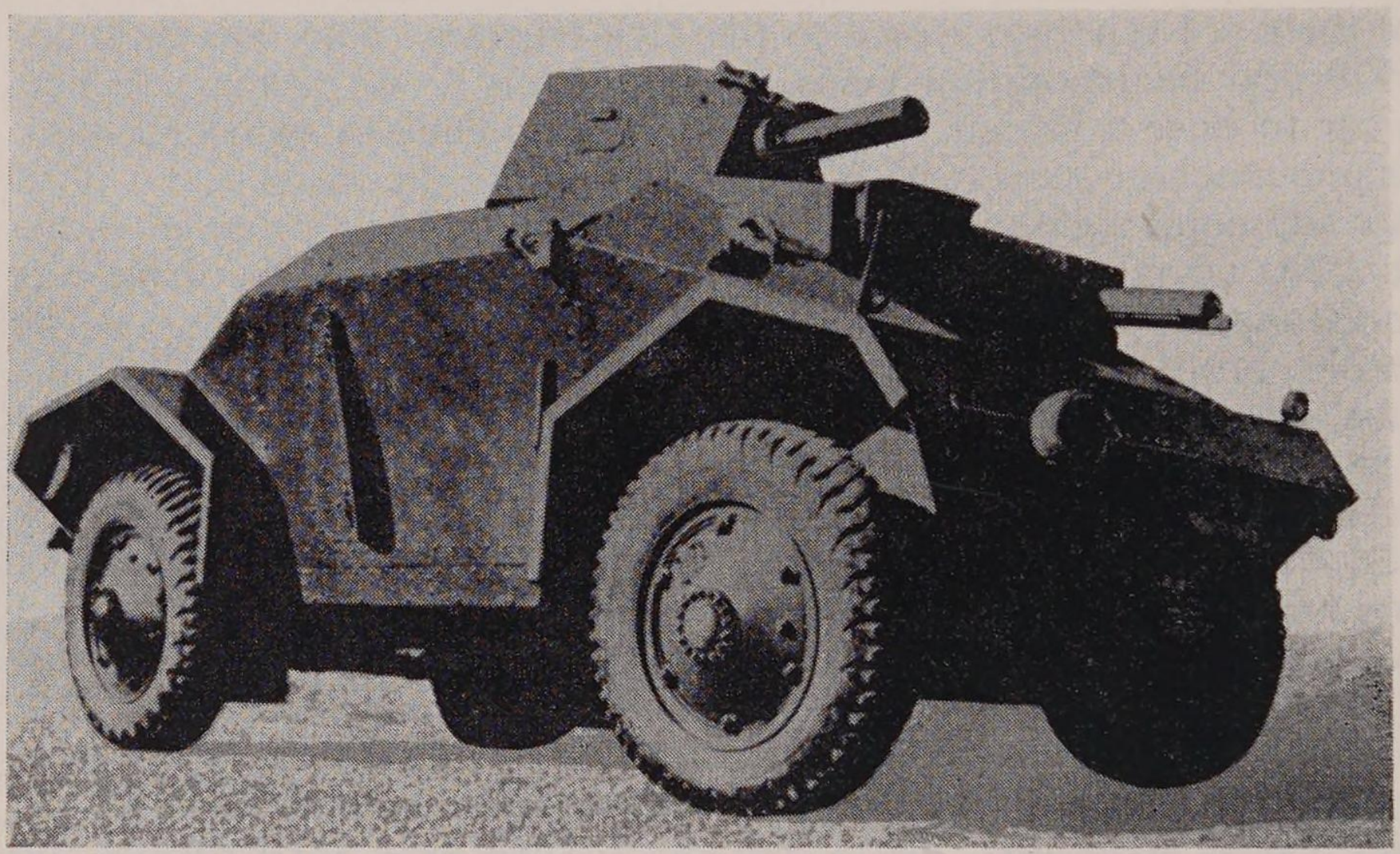
Thus, although having a satisfactory road performance they compared unfavourably in other respects with the full tracked light tanks whose development had, by now, begun. The light tank's superiority over bad going resulted in many duties previously carried out by armoured cars being taken over by light tanks. After 1932 the Armoured Car Companies R.T.C. in India were re-designated Light Tank Companies, though not all of them had been re-equipped by the beginning of the second war.

Because of the competition from the tracked fighting vehicle armoured car designers were forced away from adapted commercial chassis towards the development of specialised and more expensive vehicles.

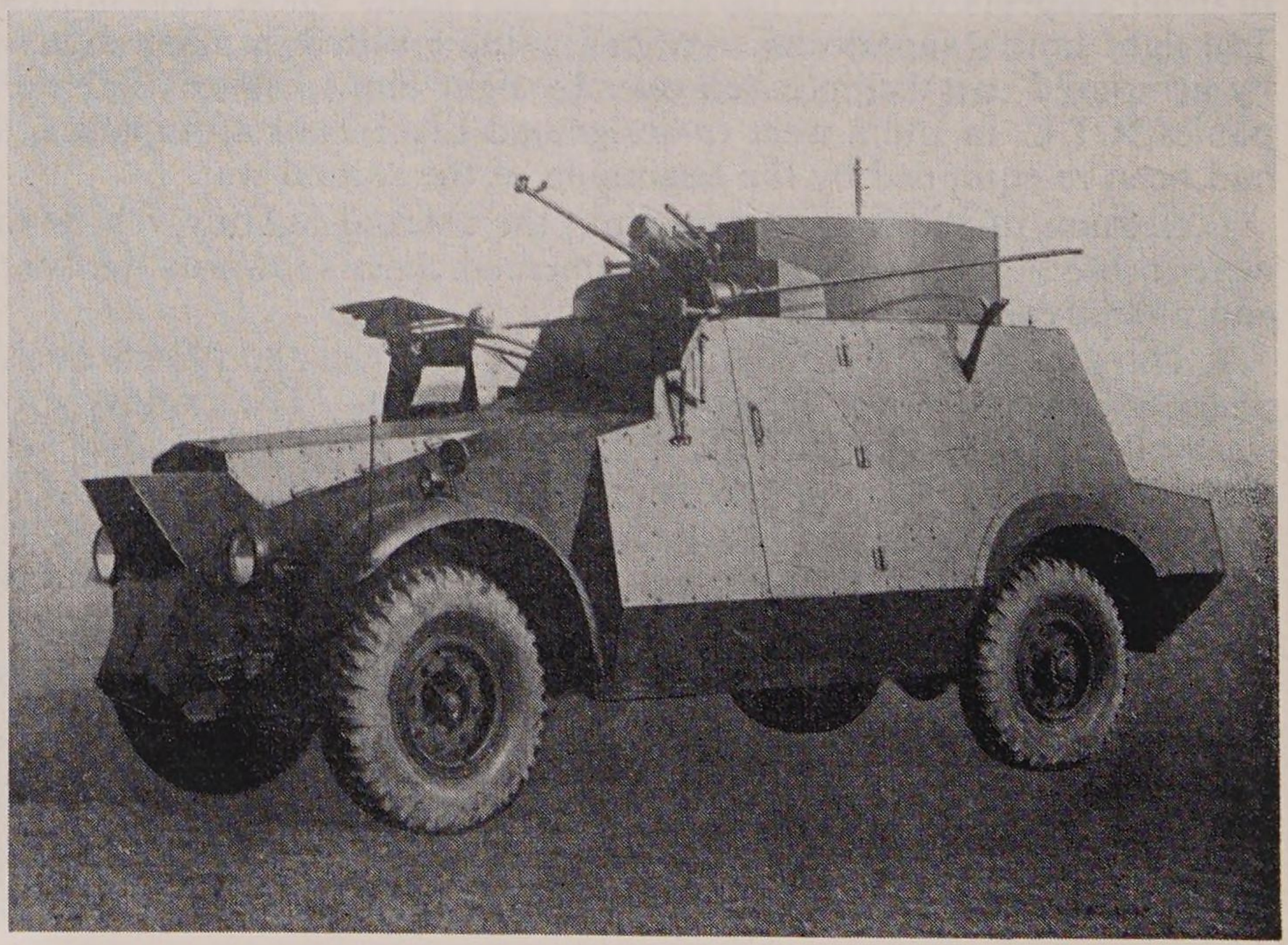
The first design of this type seen in Britain was the 1934 Straussler 4 x 4 car with dual steering, independent suspension and swing axles. The prototype of this advanced model was built in Hungary. Production was limited and though some vehicles were ordered for trials with a view to production in this country nothing came of them and they did not receive the attention they merited. This type of vehicle did not come to the fore again until 1938-1939 when further trials were made with similar foreign designs and the B.S.A./ Daimler scout car was produced.

In the meantime, between 1935 and 1939, Morris Motors Ltd. designed an experimental armoured car and produced some reconnaissance cars.

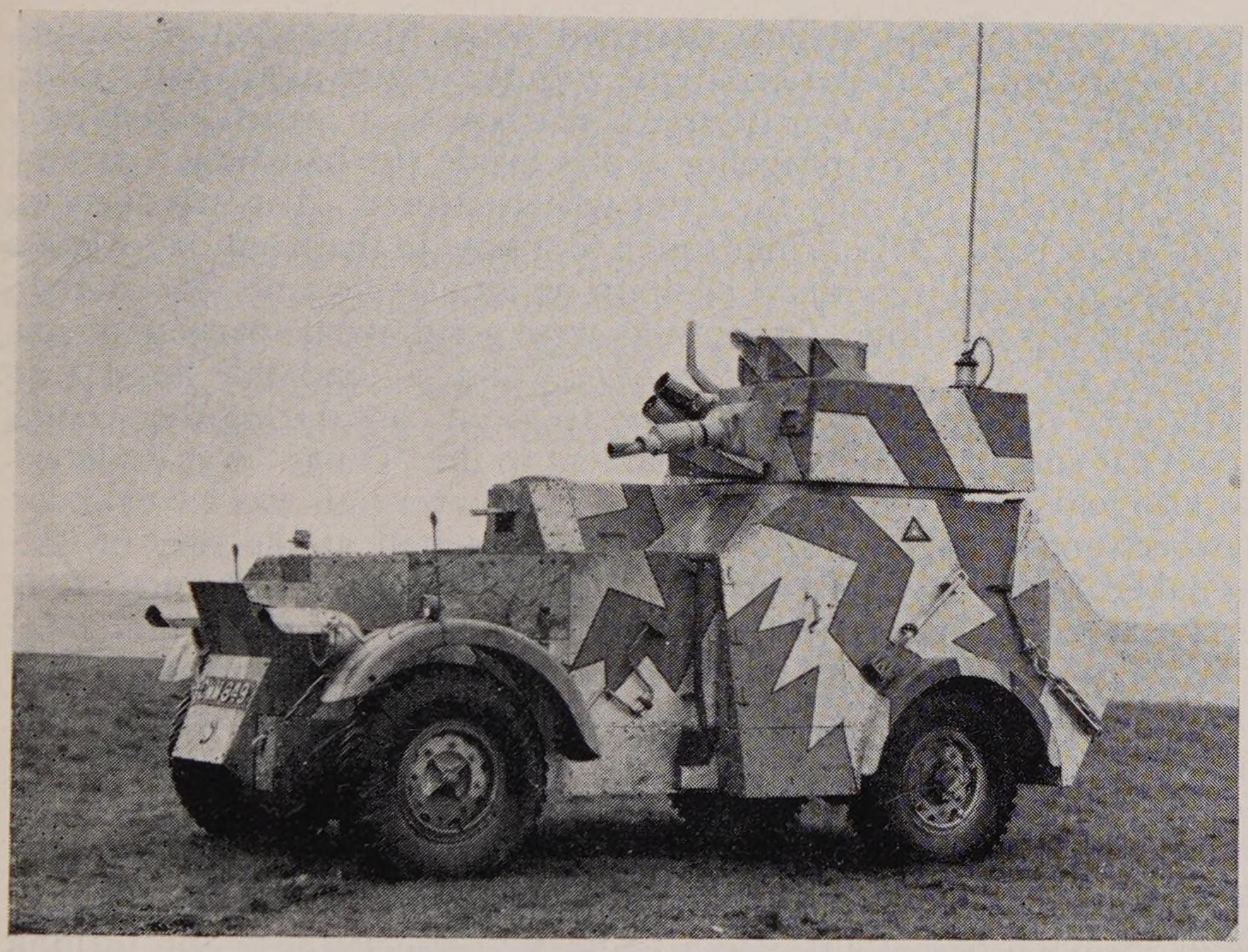
The reconnaissance car was based on a standard commercial truck chassis and weighed 4.2 tons. They were powered by Morris commercial type 25 h.p. engines with normal type transmission, four speed gearbox and foot operated hydraulic braking on all four wheels. The armament was either a .303-in. Vickers machine gun in a traversing turret or



*Straussler*
*Armoured Car*
*1938*



*Light Armoured*
*Reconnaissance Cvr*
*Morris 1939*



*Morris*
*Experimental*
*Armoured Car*
*1935-1936*

a Bren LMG and Boys anti-tank rifle, both of which were dismountable for ground use. Although these vehicles represented no advance in design, work on them continued up to the outbreak of the second war and the 12th Royal Lancers were equipped with them during the Battle of France in 1940.

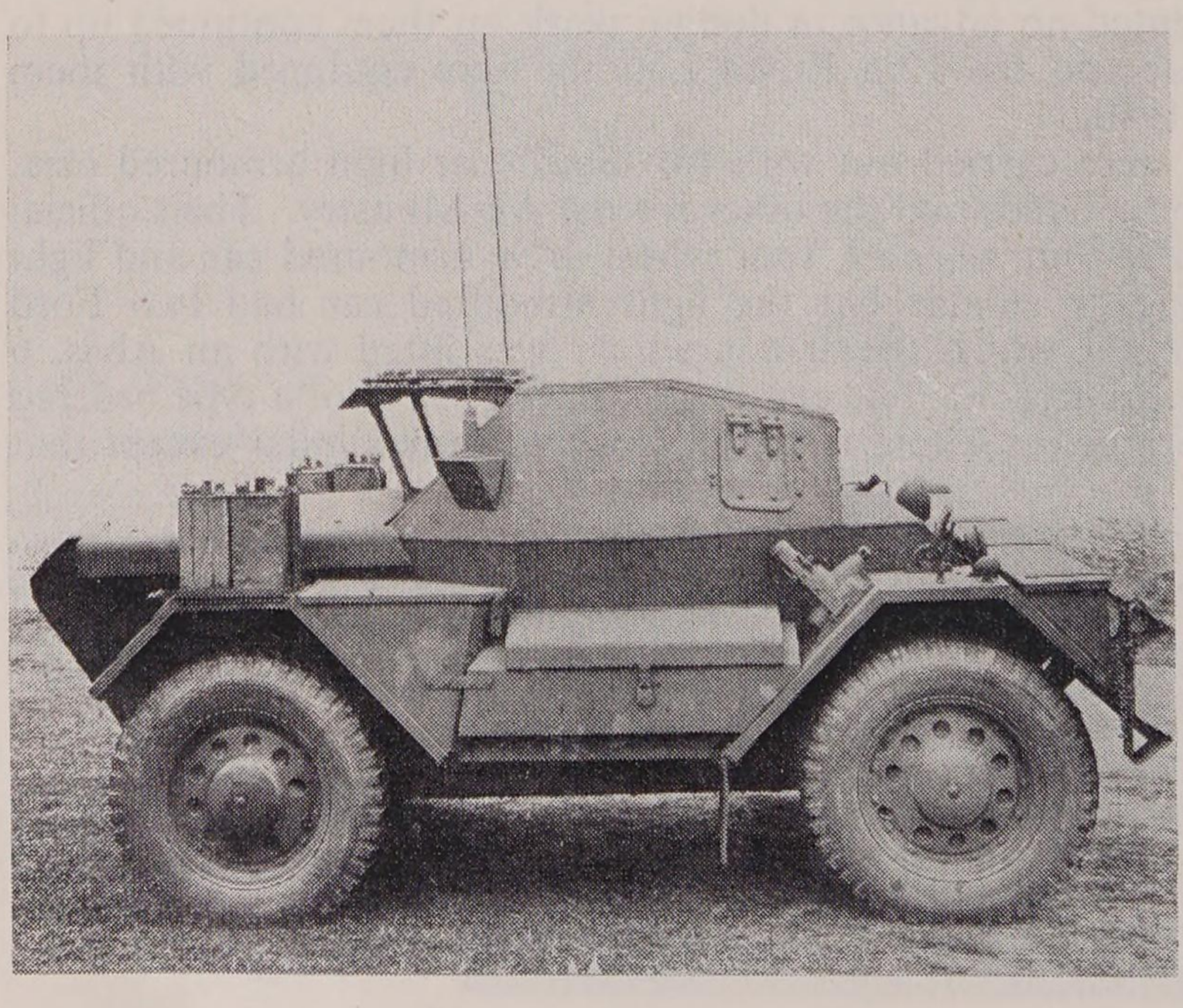
During 1938 further trials were carried out with two Straussler light armoured cars. One model was tested for the India Office and the other for the Air Ministry. Their official designations were Alvis Straussler four wheeled, four wheel drive armoured car and light armoured car. Both were basically similar but the light armoured car had two Ford 8 cylinder engines each of 3.6 litres whilst the armoured car was fitted with an Alvis, 6 cylinder engine of 4.39 litres for the R.A.F. The car shown on page 22 is of a type ordered by the Dutch East Indies Government. Those tested in England were similar except that they had no hull gun.

The two Ford engines were mounted side by side between the wheel arches. Each engine drove the wheels on its own side. The frame had a tubular backbone which acted as a compressed air reservoir for the pressure brakes. The armoured car had independent suspension, optional all wheel steering and duplicate steering controls in rear. Armour was 8 mm. and armament was a Vickers machine gun.

Two other cars were tested at about the same time. These were a Steyr-Daimler-Puch and an Alvis two seater 4 x 4 armoured scout car. The first was of Austrian manufacture with independent suspension built round a central tubular backbone with the engine at the rear. After tests four chassis were purchased for further trials and one was fitted with a Morris engine for testing. The others had air cooled engines of Austrian origin.

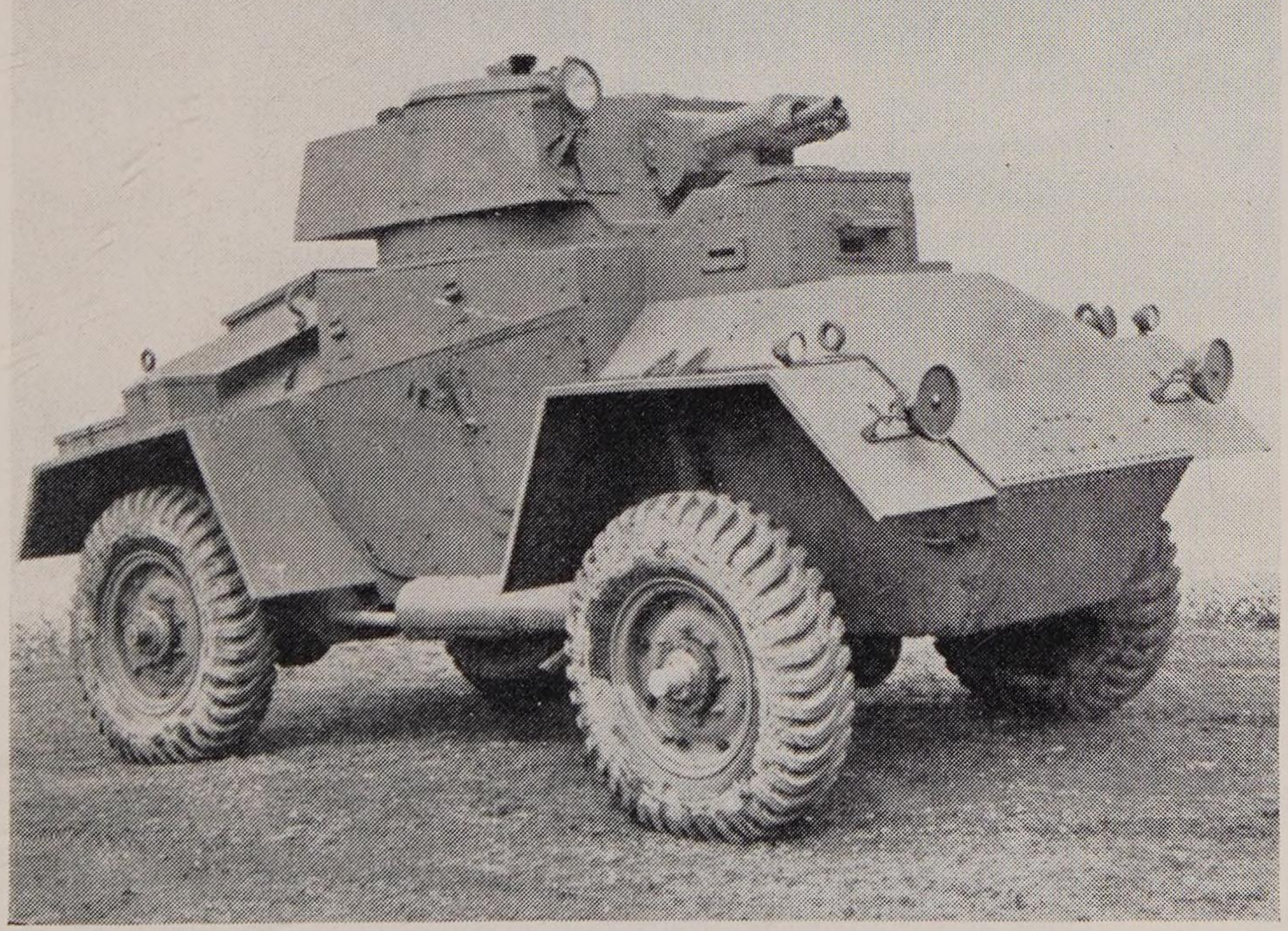
The scout car was an experimental vehicle designed to a Mechanization Board specification. The chassis consisted of a tubular backbone with the engine at the rear on the offside. Drive was transmitted through a synchromesh gearbox to a transfer case and thence through double helical spur gear by propellor shafts inside the backbone. It had independent suspension on all wheels but only the front wheels steered. The armour was 14 mm. and the armament was a Bren LMG firing from a loophole in the front. Provision was made for the crew of two to travel in a raised position on adjustable seats, the gunner having an all round traverse in this position. Trial results were good, particularly in rough going and heavy sand. This car was known as the Alvis "Dingo" and this name was generically and incorrectly used by the Army in referring to scout cars during the second war. In 1937 another scout car similar in body and armament to the "Dingo" was designed by B.S.A. This 4 x 4 car also had independent suspension. The power unit was a 6 cylinder engine with a fluid flywheel and Wilson gearbox centrally mounted at the rear of the chassis. The drive was taken from the engine to a transfer box and then through four propeller shafts and bevel gears to the front and rear wheels. There was only one differential gear situated in the transfer box but this also contained a reverse gear enabling all four speeds to be used in reverse. The four wheel steering was progressive so that the rear wheels did not steer until the front wheels approached full lock. In reverse the front wheels were automatically locked and the rear wheels used for steering. It weighed 10 cwt. more than the Alvis "Dingo".

In trials during 1938 it proved inferior in speed on hills and acceleration to the "Dingo" but faster and more stable on the level. It also had a better ground clearance and turning circle. As a result of these tests the more expensive Alvis, although simpler in design, was



*Daimler Scout Car*
*1937-1939*

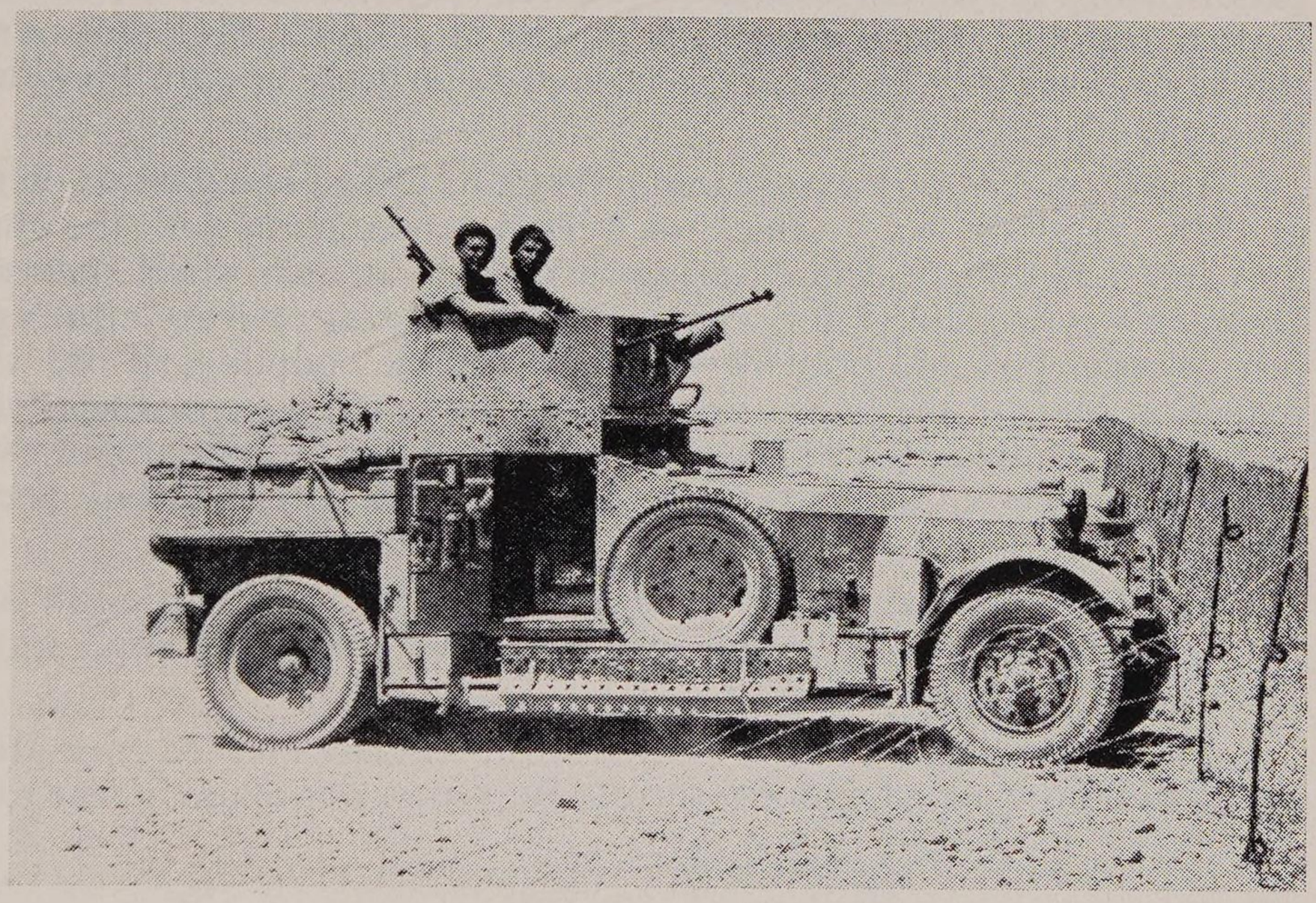
dropped in favour of the B.S.A. design and this was now taken over by the Daimler Company and became the well known Daimler scout car which was used in all theatres of war between 1940 and 1945. Production of the Daimler scout car began at the end of 1939 and resulted in an open top 3.15 ton vehicle with a 6 cylinder, 60 b.h.p. Daimler engine located at the rear. A five speed pre-selector gearbox was used and the independent suspension was of the double wishbone type with double coil springs. The Mark 1 retained the four wheel steering but on later versions this feature was discontinued. The crew of two were given overhead protection by means of a sliding roof which was later replaced by one of a folding type and finally done away with altogether. This vehicle was the fore-runner of the Daimler armoured car described in the next section.



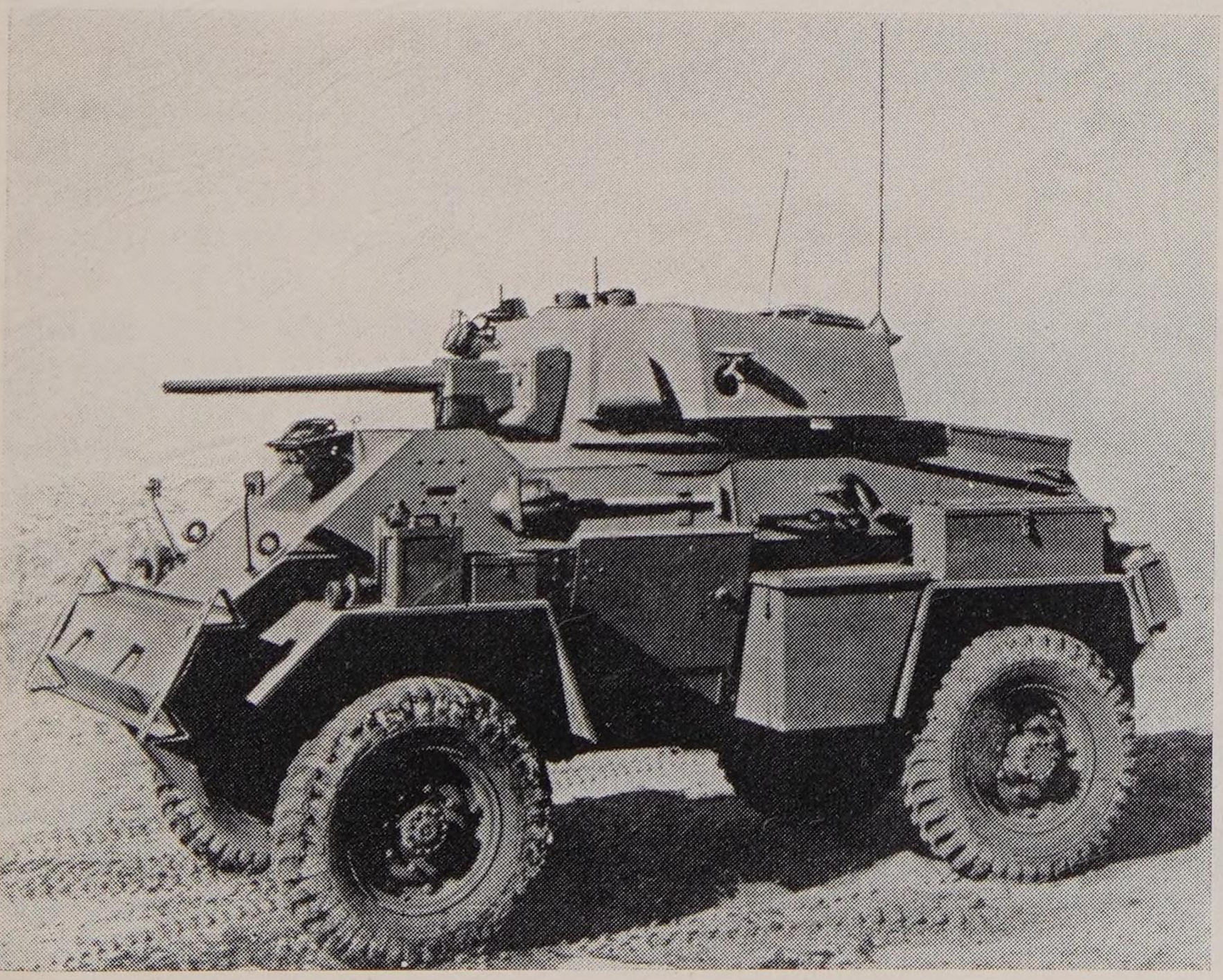
*Guy Armoured Car Mark I 1938-1939*

In the armoured car field a similar 4 x 4 development was represented by the Guy which was also described as a "wheeled tank". A Meadows, 6 cylinder, 61 b.h.p. engine, mounted at the rear, gave the car a top road speed of 35 m.p.h. Due to the initiative of Guy Motors Ltd. welded armour was used for the first time, a practice which was to become almost universal.

A periscope in the turret roof and a bullet proof laminated glass block for the driver, provided improved and protected vision. The armament consisted of .303-in. and .5-in. Vickers machine guns coaxially mounted with a telescopic sight. The mounting was shoulder controlled in elevation but the traverse was by worm hand gear. Special "Trak Grip" tyres were fitted and the armour thickness was 15 mm. The Mark IA which followed was identical except for a change in armament to 15 mm. and 7.92 mm. Besa machine guns. Thus by the outbreak of the Second World War armoured cars in service with the British Army were confined to the Morris, Guy, Rolls Royce and Daimler (Scout) cars, which indicates the relatively low priority given to the development of these equipments between the wars.



*Rolls Royce 1924 pattern, seen in the Western Desert in 1940*



*Humber Mark 4 1943*

At the outbreak of war in September 1939 the 11th Hussars were equipped with 1924 pattern Rolls Royce cars which were fitted with a modified turret having an open top and faceted armour. The armament consisted of a Bren LMG, Boys anti-tank rifle and 4-in. smoke dischargers. These cars were used extensively in patrolling the Egyptian frontier in the early days of the War.

The Daimler Mark 1 appeared in 1940, its design being based on the scout car produced in 1938. It was a 4 x 4 vehicle of welded construction with the chassis integral with the hull and independent helical spring suspension at each wheel station. The drive from the Daimler 6 cylinder 95 b.h.p. engine at the rear was conveyed through a pre-selector gear-box, transfer box and propeller shafts to flexible couplings at the wheel stations and final reduction gears in the hubs. The transfer box and five speed gearbox gave equal forward and reverse mobility for which a rear steering wheel and vision port was also provided. The four wheel steering of the original design proved unsatisfactory and was discontinued on later models.

The armament consisted of a shoulder controlled 2-pr. gun and co-axial 7.92 mm. Besa machine gun. The gunner was provided with a telescope and observation episcope protected by a steel flap.

The turret was fitted with geared hand traverse and the turntable floor of the fighting compartment revolved with the turret. Provision was made for the carriage of a wireless set

*Daimler*
*Armoured Car*
*Mark 2*
*1941*

and the commander had a tank type periscope with a horizontal field of view of 50° and a vertical field of 20°. This was used in conjunction with a turret sighting vane to line up the gun on the target. Armour thickness was from 14 mm. In 1941 the Mark 2 was produced and differed from the Mark 1 in the type of gun mounting, modifications to improve the driver's escape hatch and engine covers. The Mark 1 suffered initially from failure of the gearbox coupling and it was not until 1942 that they were fully operational in the Middle East.

In 1941 the Humber Mark I armoured car replaced the Guy to which it was similar, being a short wheel-base 6.5 ton vehicle with a "Super Snipe"engine and Commer components. Also in 1941 the Marks 2 and 3 were introduced and in 1943 the Mark 4. In Marks 2 and 3 the engine and armament, 15 mm. and 7.92 mm. Besa co-axial remained the same, but the turret of the Mark 3 was enlarged and the crew increased to four. The Mark 4 carried a 37 mm. gun with a co-axial 7.92 Besa machine gun.

The hull was of nickel chrome molybdenum steel and the turret was rotated by a single speed hand traversing gear.

Protected vision was provided for the commander by means of a periscope and the driver by a laminated glass block, Drive was normally on the rear wheels but four wheel drive could be engaged by means of a shift lever. For driving in reverse an observation port in the engine bulkhead could be uncovered by operating a hydraulic pump and raising the engine cover. A Canadian built version of the Mark 3 was named the "Fox" and armed with .303 and .5-in. Browning machine guns. Armour thickness on the Humbers was 8-14 mm.

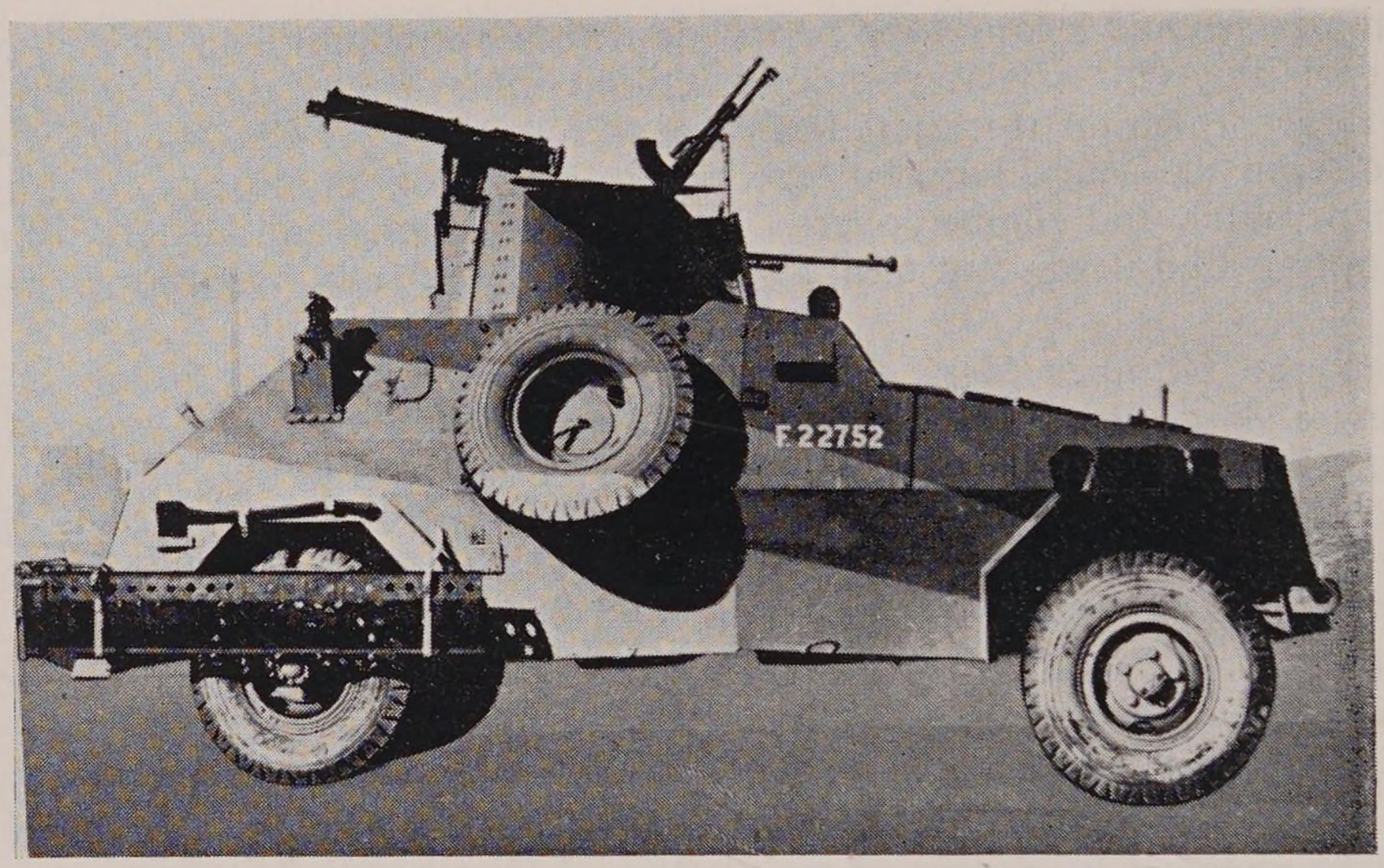
The Morris Armoured Reconnaissance Car together with Humbers and Daimlers were all used during the Western Desert and North African Campaigns with considerable success by the 11th Hussars, 12th Lancers, Royals, K.D.G., H.C.R., 1st and 2nd Derby Yeomanry, 4th and 6th South African Armoured Car Regiments and the 3rd South African Reconnaissance Regiment. Daimlers were also used with good results in Italy, Sicily and South East Asia.

In North West Europe the 1st and 2nd Household Cavalry Regiments, Royals, 11th Hussars, Inns of Court and Regiments of the Reconnaissance Corps used Daimler and Humber Mark 4 cars. Some of the Daimlers were by now fitted with the "Littlejohn" adaptor fitted to the 2-pr. gun and firing a special super velocity projectile.

From late 1940 until the Daimler became fully operational Marmon-Herrington armoured cars were extensively used in the Western Desert by the K.D.G., and the South African armoured units. This vehicle was built in South Africa, the engine, transmission and suspension being imported from North America and the 2-pr. guns from the United Kingdom.

The first of these vehicles was designated as the South African Reconnaissance Car Mark I and is believed to have been used only by the Union Defence Forces and not issued to British units.

It consisted of a Ford 4 x 2 chassis, with a V8 engine and a crew of four. The armour was from 6-12 mm. and the armament two Vickers .303-in. machine guns, one mounted in a circular turret and the other in the rear left side of the hull. The Mark 2, which also




*Marmon-Herrington Mark 2 1940*

carried the British designation of Marmon-Herrington Mark 2, was used in the Middle East from 1941 until the end of the Tunisian Campaign. It was similar in basic details to the Mark 1. It was armed with a Boys anti-tank rifle mounted in an octagonal turret with a co-axial Bren LMG and two anti-aircraft machine guns one of which was a Bren and the other a Vickers.

Although a reliable reconnaissance vehicle it was under-gunned and units in the Middle East carried out unofficial modifications to mount captured enemy weapons with an armour piercing capability. This could only be done by removing the turret and relying on gun shields for frontal protection. Whilst this was reasonably effective against ground attack and gave higher speeds and a lower silhouette it made them more vulnerable to air attack. Various enemy weapons were used, the most common being the Italian 20 and 47 mm. Breda, and the German 37 and 28/20 mm. with a tapered bore similar to the "Littlejohn" adaptor in effect. A French 25 mm. gun was also used.

The armour basis was similar to the Mark 1, the radiator being protected by twin doors with horizontal slit louvres and the driver by a hull width, hinged, solid plate with two observation slits. There were single exit/entry doors on either side and a double door in rear, all in the upper part of the hull.

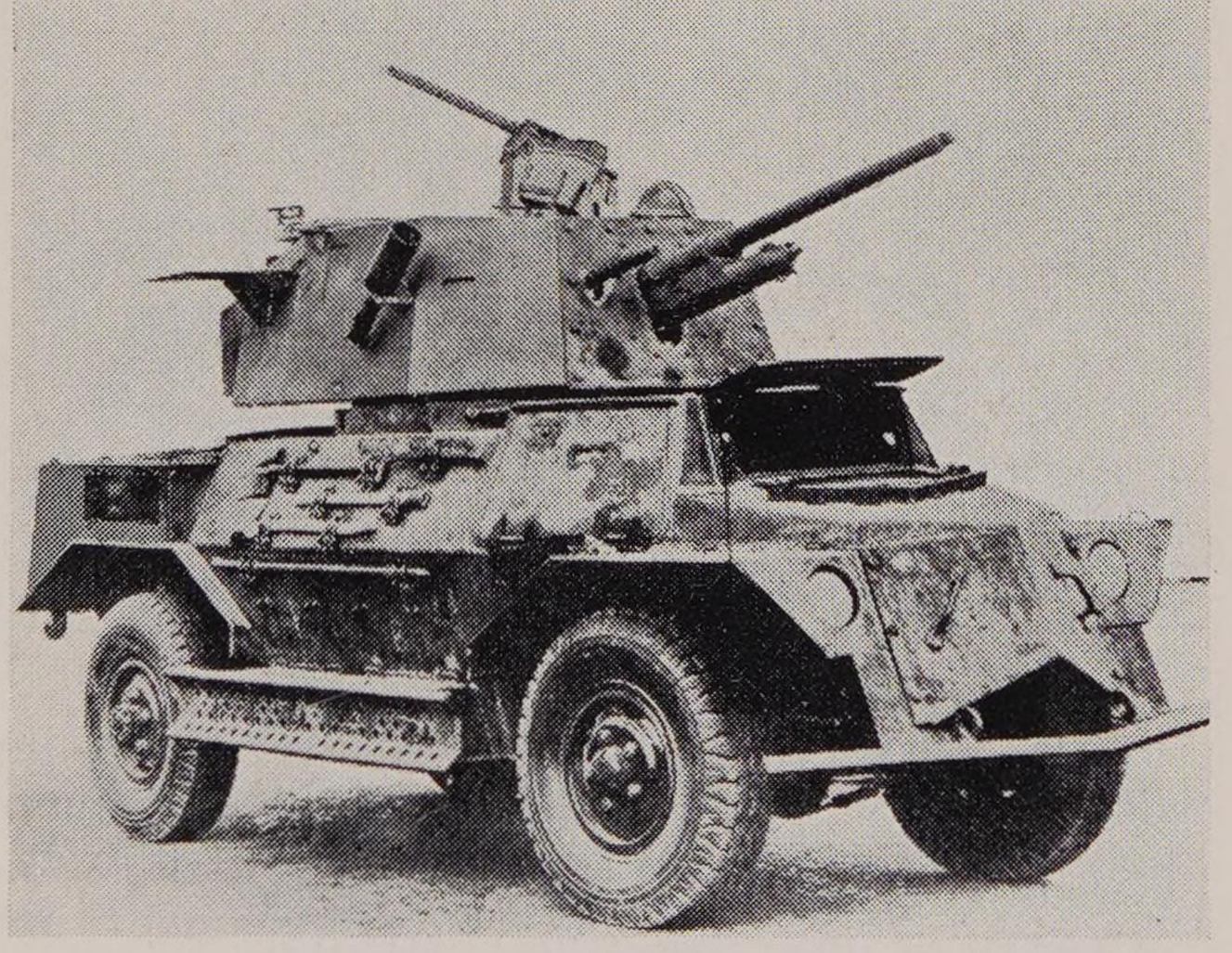
The Mark 3 was essentially an improved Mark 2 but with a shorter 8-ft. 9-in. wheelbase and other improvements weighing $5\frac{1}{4}$ tons laden. In some later models of this mark the horizontally louvred radiator plates were replaced by solid angled plates hinged at the top and the driver's cab provided with two, flap type, observation plates also hinged at the

top. The rear door was changed to a long, single plate type and the spare wheel previously mounted at the back moved to one side.

Armour and armament were as for the Mark 2 and units took similar liberties in modifications to the armament. This car was introduced in 1941 and continued in service until late 1943.

There was also a Mark 3A which was the same basic vehicle fitted out as an anti-aircraft vehicle by removing the turret and fitting either one Vickers .303 or .5-in. machine gun or twin Vickers .303-in. on a ring mounting protected by a steel skirt.

*Marmon-Herrington*
*Mark 4*
*1943*

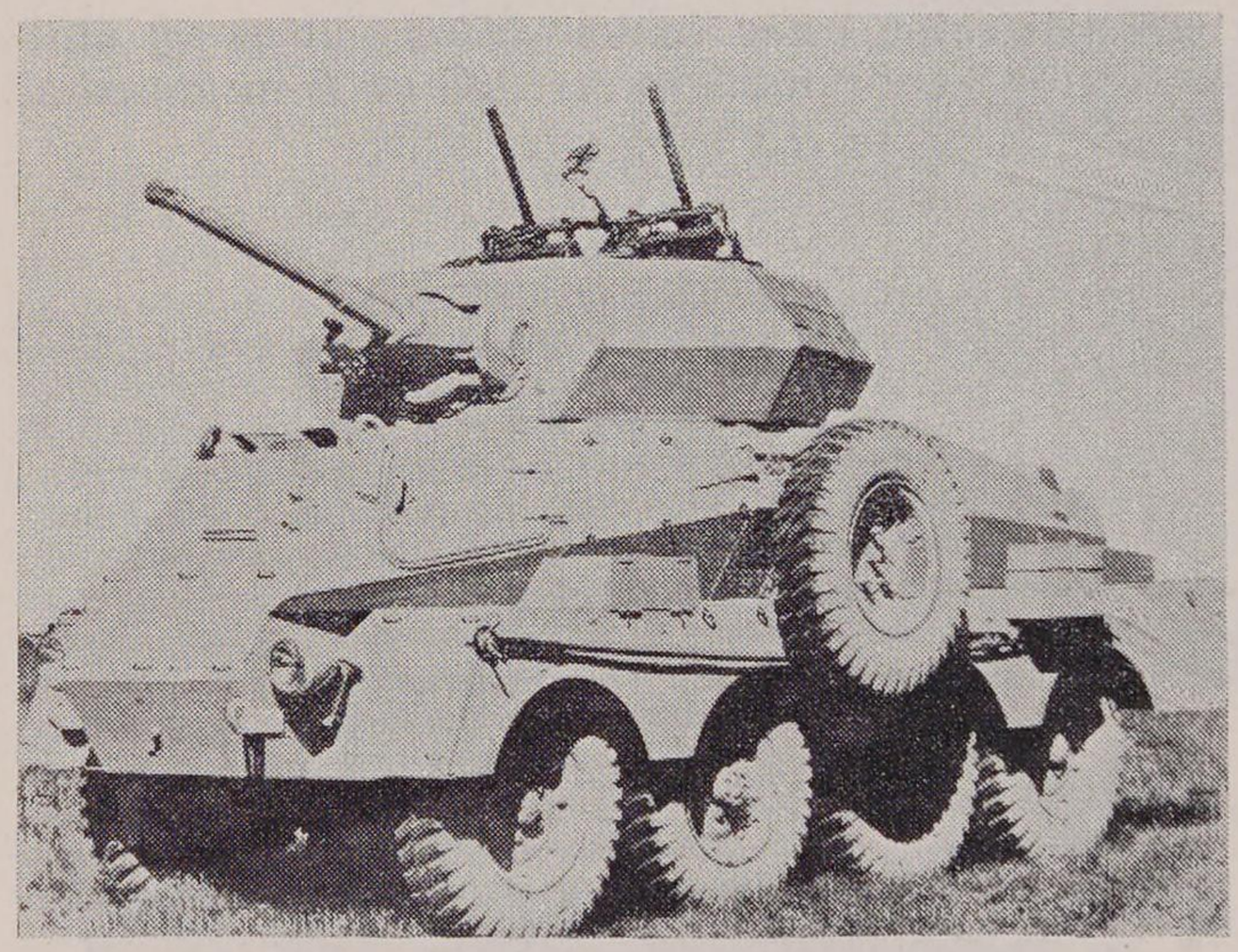


The Mark 4 was a 4 x 4 vehicle using Ford and Marmon-Herrington components. The conventional chassis was abandoned and the suspension, engine and transmission bolted direct to the armoured hull. The Ford V8 engine was located at the rear of the vehicle some of which were equipped with "Runflat" tyres. The armour was of the same 6-12 mm. thickness as before but a slight angling of the plates gave added protection. The armament was the British 2-pr. Q.F.S.A. gun in a polygonal two man turret and in later models a co-axial .30-in. Browning machine gun was added. Either .303 or .5-in. Vickers or .30 or .5-in. Browning machine guns were also fitted for anti-aircraft defence.

A length of 15-ft., width 6-ft., and a height of 7-ft. gave a laden weight of 6 tons 2 cwt. This car was designed to give an anti-tank capability in support of the Mark 3 in the armoured car regiments. Due to production delays they did not appear until March 1943.

There was also a Mark 4 X and 4 F. The first had only a South African designation and differed only in that the engine faced forward with the gearbox and radiator mounted at the

rear. As far as is known this vehicle was not used by British units. The second had both South African and British designations but used a Canadian Ford F60L chassis with 4 x 4 transmission. There seems to have been no Mark 5 design but three other marks were either designed or produced.



*Marmon-Herrington*
*Mark 6*
*1942-43*

The Mark 6 was an eight wheeled car with four axles grouped in two conventional bogie pairs with semi-elliptic springs mounted on trunnions. "Runflat" 10.50 x 20-in. tyres were fitted. Steering was on the front and rear axles only and these were of the Marmon-Herrington driven type. The two middle axles were of Ford manufacture with Warford transfer boxes. Power was supplied by two Ford Mercury engines which, with their clutches and gearboxes, were mounted side by side in the rear of the vehicle.

The outputs from the gearboxes were taken to a special transfer box at the rear which coupled them together to a single propeller shaft. This led forward under the engines to number three axle to which it was directly coupled. A transfer box on this axle took the drive to number four and the two front axles.

Angled armour plates between 10-30 mm. were designed to give a protection equal to 40 mm. in front and 20 mm. elsewhere.

The open top turret mounted a 2 or 6-pr. gun with a .30-in. co-axial Browning machine gun. There were also .30-in. twin Brownings in a special anti-aircraft mounting. The three man turret had a rotating platform and electrical power traverse. No observation ports were provided for the commander and loader but the driver had two periscopes for use when closed down.

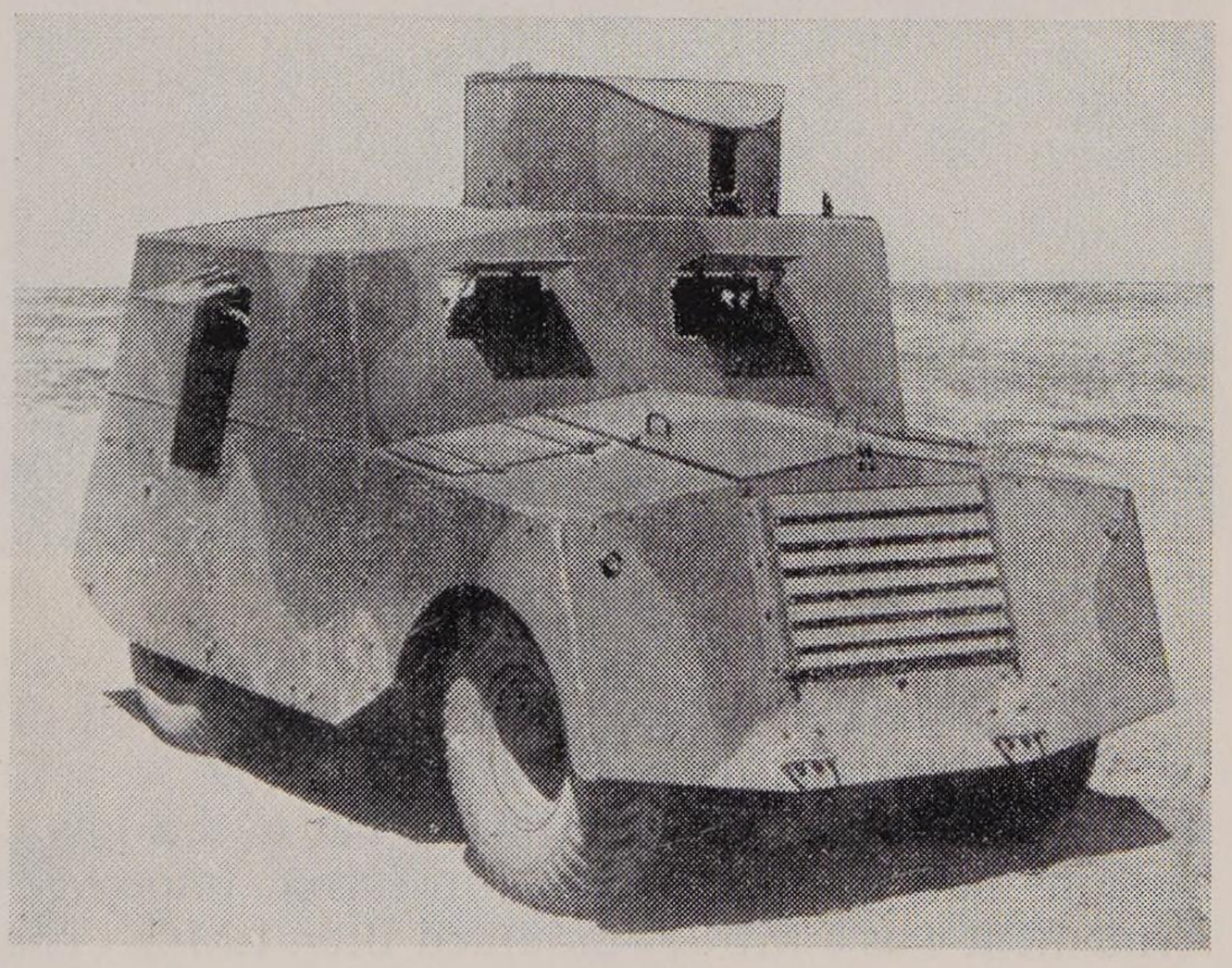
A Mark 7 A/A version similar to the Mark 3A was also designed and at least one prototype produced and similarly a Mark 8 design based on the Mark 7 was also considered. It seems likely that these vehicles were intended to replace the Marks 3 and 4 in the

anti-aircraft and anti-tank role respectively but, due to production difficulties and the Italian theatre being largely unsuitable for armoured cars, neither they nor the Mark 6 went into production and all other production of Marmon-Herringtons was stopped in 1943.

After the battle of France in 1940 there was an urgent need for armoured vehicles for home defence and the Middle East theatre, being now the main scene of action, was rightly given priority for existing stocks and reserves of all types of equipment. This resulted, once again, in a number of improvised designs on standard motor car chassis.

The Humberette was the first of these hastily constructed vehicles on a Humber Snipe chassis. The open top armoured body carried a crew of three. The 14 h.p. Standard Beaverette was a similar type of vehicle.

*Standard Beaverette Mark 3 1940*



The armament in both cases was a Bren LMG and/or Boys anti-tank rifle both dismountable for ground action. These vehicles were generally known as reconnaissance cars and the Reconnaissance Corps, formed in 1941, used them for its early training.

The Humber Mark 1 Light Reconnaissance Car was a development of the Humberette and these vehicles were named "Ironsides".

It was similar in layout to the Humberette but had W.D. type wheels with heavy duty tyres. The engine was a Humber 6 cylinder, 85 b.h.p. which gave the car a road speed of about 70 m.p.h. The Mark 2 was equipped with roof armour and an open top anti-aircraft turret mounting a Bren LMG. A Boys anti-tank rifle was mounted in the hull front. With a crew of three the vehicle weighed 3.8 tons. Humber development ended with

the Mark 3 which was similar to the Mark 2 but with four wheel drive and a turret modification to allow the use of a 100 round Bren magazine. The Mark 3A was fitted with desert equipment including sand channels carried at the rear.

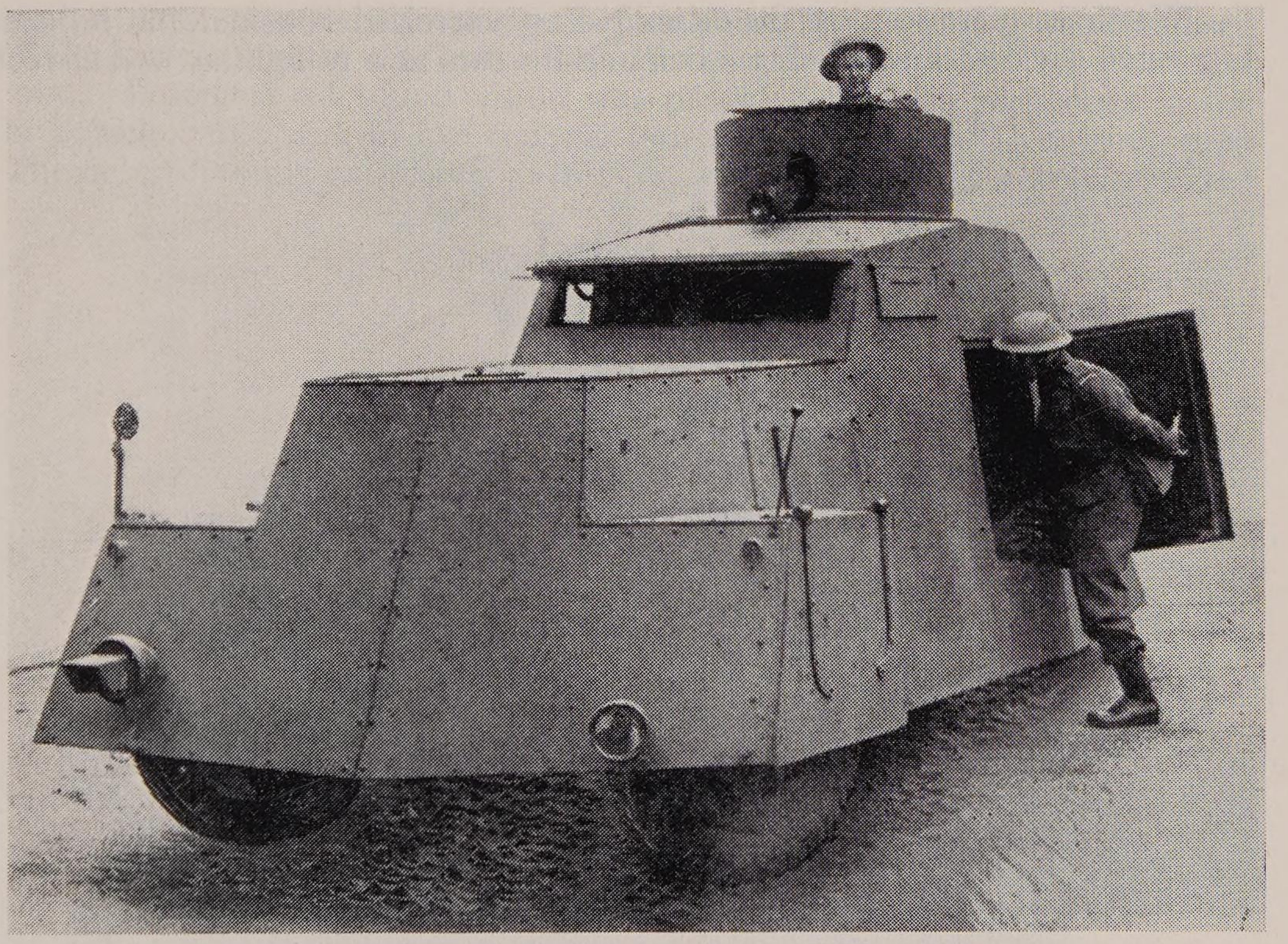
*Humber Light*
*Recce Car*
*Mark 2*
*1941-1943*

The Standard Beaverette was also developed. The Mark 2 was similar to its predecessor but with additional rear armour and some were fitted for wireless. The Mark 3 had the same 4 x 2 chassis as the Mark 2 but had a low circular turret with a hinged lid. Later versions had a higher, open top turret, improved radiator grill and lighting equipment. Armament was a Motley mounted Bren LMG. The Mark 4 had stepped up frontal armour giving more crew room and a high open top tueret. These vehicles weighed $2\frac{1}{2}$ tons and had a road speed of 24 m.p.h.

Among many improvisations in the tense days after Dunkirk one, in particular, should be noted here. This was an armoured body on a Rolls Royce private car chassis which saw service with an L.C.C. Battalion of the Home Guard.

In 1941 another reconnaissance car was produced by Morris Motors Ltd.

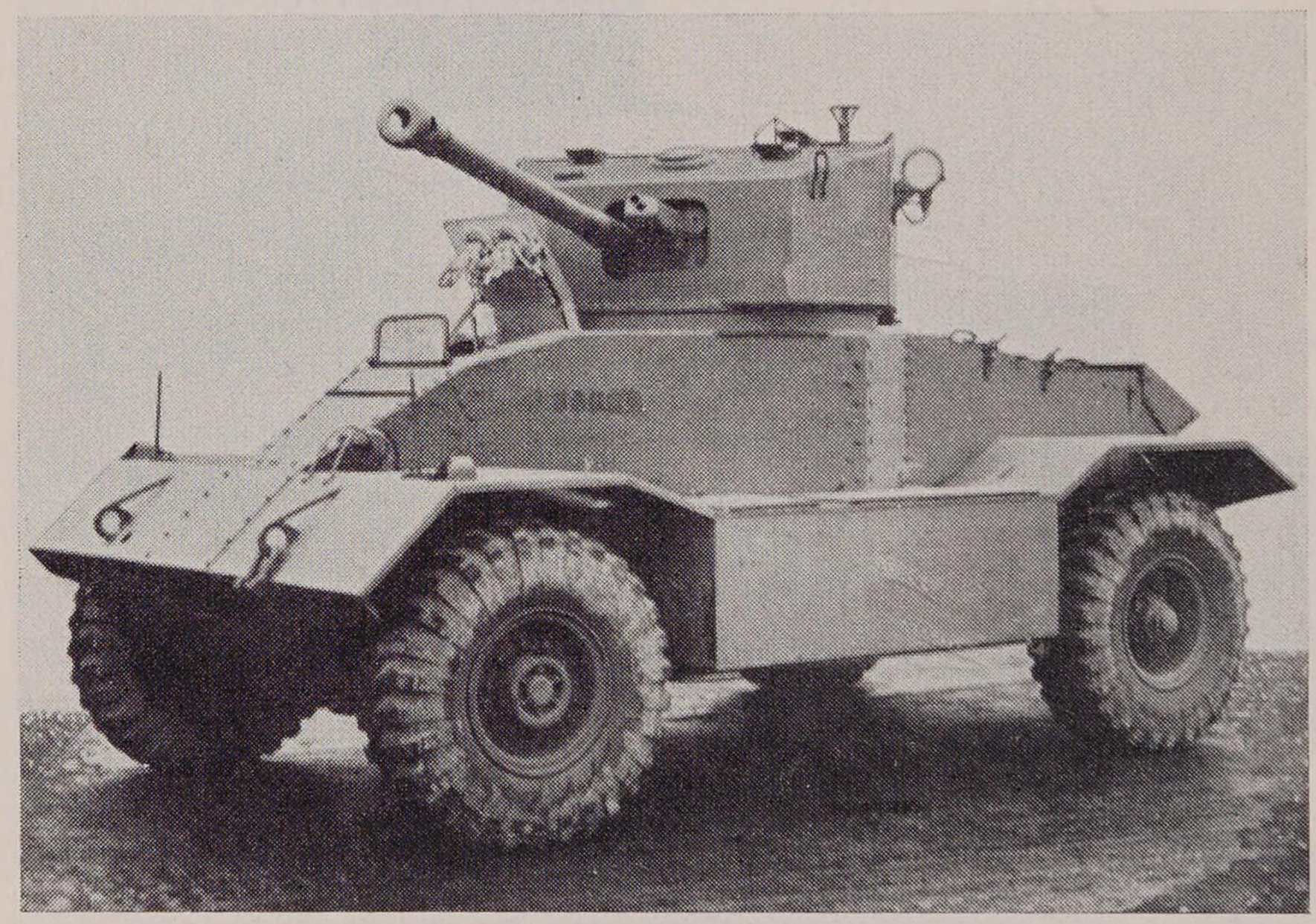
The vehicle was of unit construction and of welded armoured plate with a manually operated 360° revolving turret mounted on flanged rollers, above the driver's compartment, on the offside. With a crew of three and armour of 8-14 mm., this car weighed 3 tons 14 cwt. The Mark 2 was 4 x 4 but otherwise identical with the Mark 1. The Mark 2 was used by Divisional Reconnaissance Regiments between 1941 and 1945 and about 225 of the Mark 1 were used by the R.A.F. The armament was a Bren LMG and Boys anti-tank rifle.



*Rolls Royce Armoured Car, Home Guard, 1941*

*Car, Light, Reconnaissance, Morris, Mark 1 and 2, 1941*

Wartime operations in the Middle East exercised considerable influence on British Armoured car design and led to a demand for cars able to fight as well as reconnoitre.



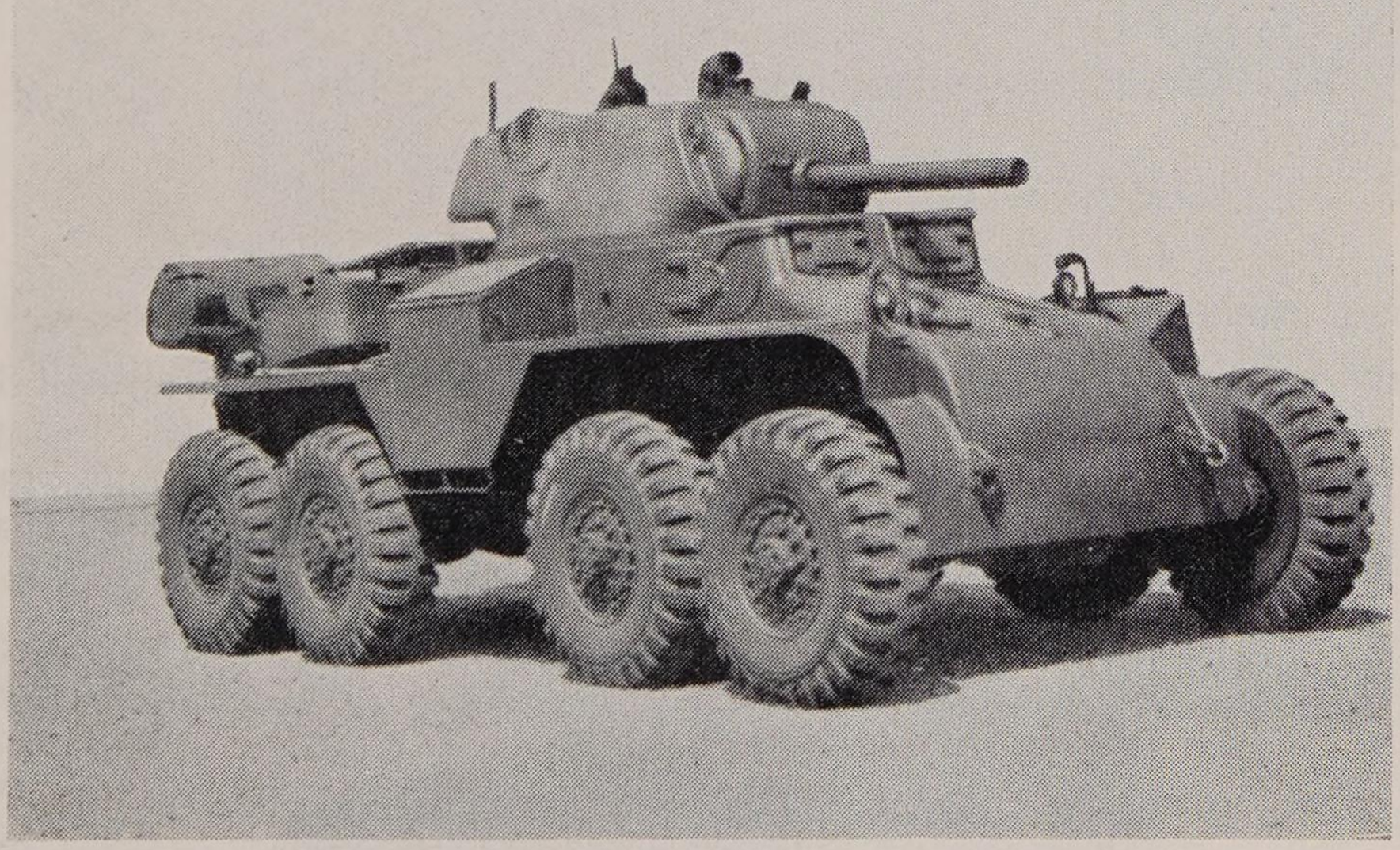
*A.E.C. Mark 3 1942*

To meet this the A.E.C. Mark 1 was produced in 1942. This was a heavy 4 x 4 vehicle with the engine at the rear and made use of many components of the Matador gun tractor.

It had a Valentine tank type turret mounting a 2-pr. gun and co-axial 7.92 mm. Besa machine gun with an armour thickness of 25 mm. The engine was the A.E.C., 6 cylinder, Type A195 diesel of 105 b.h.p. The car was 17-ft. long, 9-ft. wide, 8-ft. 4½-in. high, weighed 11 tons and had a crew of three. The Mark 2 was a similar vehicle but carried the 6-pr. (57 mm.) gun, had improved frontal armour, a larger turret, a more powerful engine of 158 b.h.p. and the crew was increased to four. This car was not as successful as had been expected. Users considered the 6-pr. gun inadequate as a support weapon owing to its poor HE performance. The A.E.C. Mark 3 was therefore equipped with a 75 mm. gun and weighed 12.7 tons. All marks had electrical power and hand traverse for the turret. The Royals and K.D.G. used A.E.C. cars in North Africa in 1942 and later in Italy. They were also used by The Royals in N.W. Europe.

The demand for heavier armament from the Middle East and North African theatres of war resulted in a heavy 8 x 8 car being built in America to British specifications. Weighing 23.6 tons, the Boarhound was of welded construction and had a road speed of 50 m.p.h. The steering, which could be power operated by selection, acted on the front four wheels. The fuel system included two self sealing jettison tanks carried on the rear deck of the hull and gave a total fuel capacity of 210 gallons. The main armament was a British 6-pr.

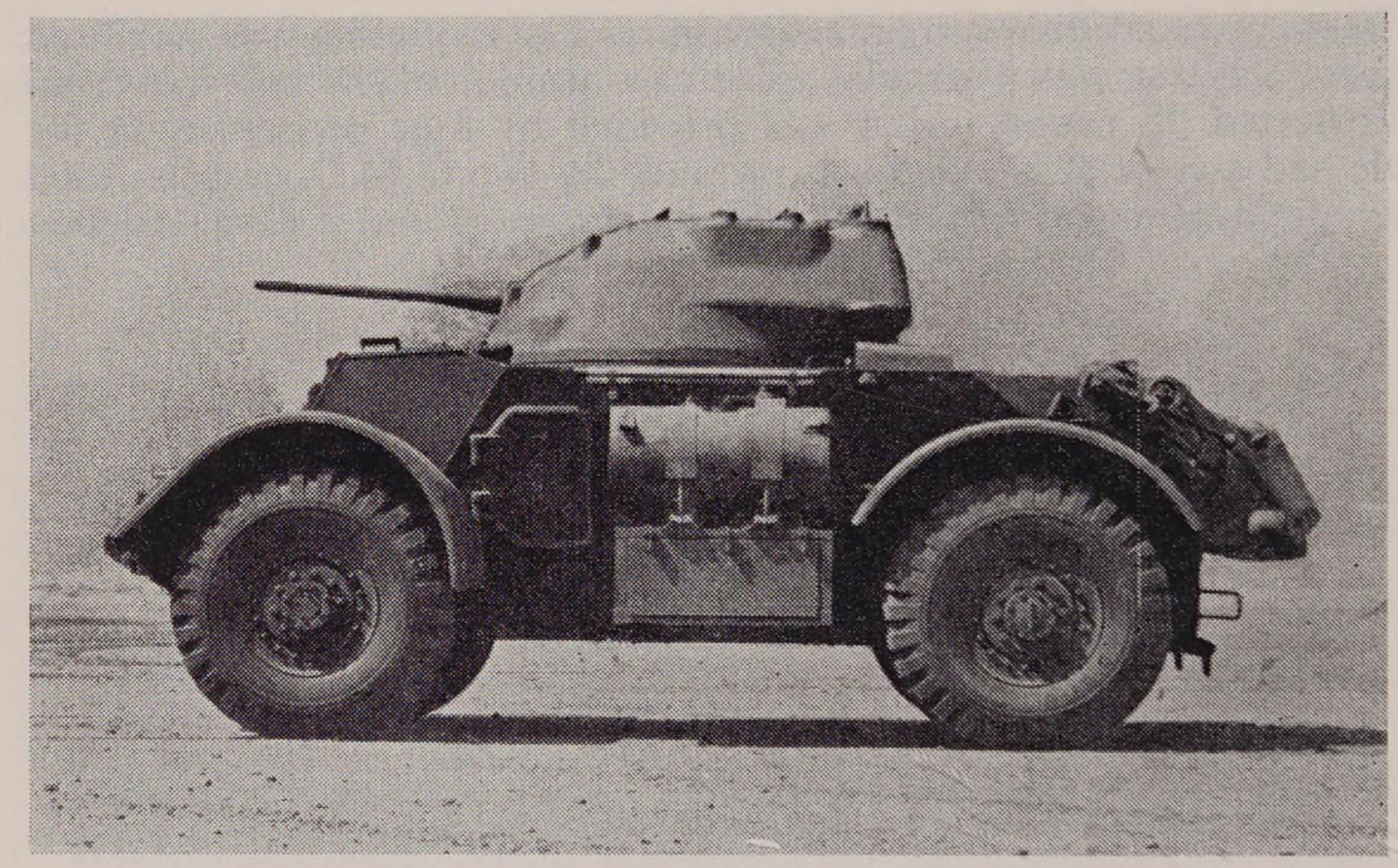
(57 mm.) gun with a .30-in. co-axial Browning machine gun. The mounting was stabilised in elevation and the turret traverse was hydraulic. The cast armour of the hull front and turret was 75 mm. Protected all round vision was provided by four periscopes in the turret roof. The vehicle had a crew of five and was powered by two G.M.C. engines, each of 125 b.h.p. The desert fighting ended before this car could be used and it never reached production.



*Boarhound (T18E2) 1942*

Three other cars of American design and manufacture were also used by British units between 1943 and 1945. These were the Staghound and Greyhound Armoured Cars and the White Scout and Reconnaissance Car.

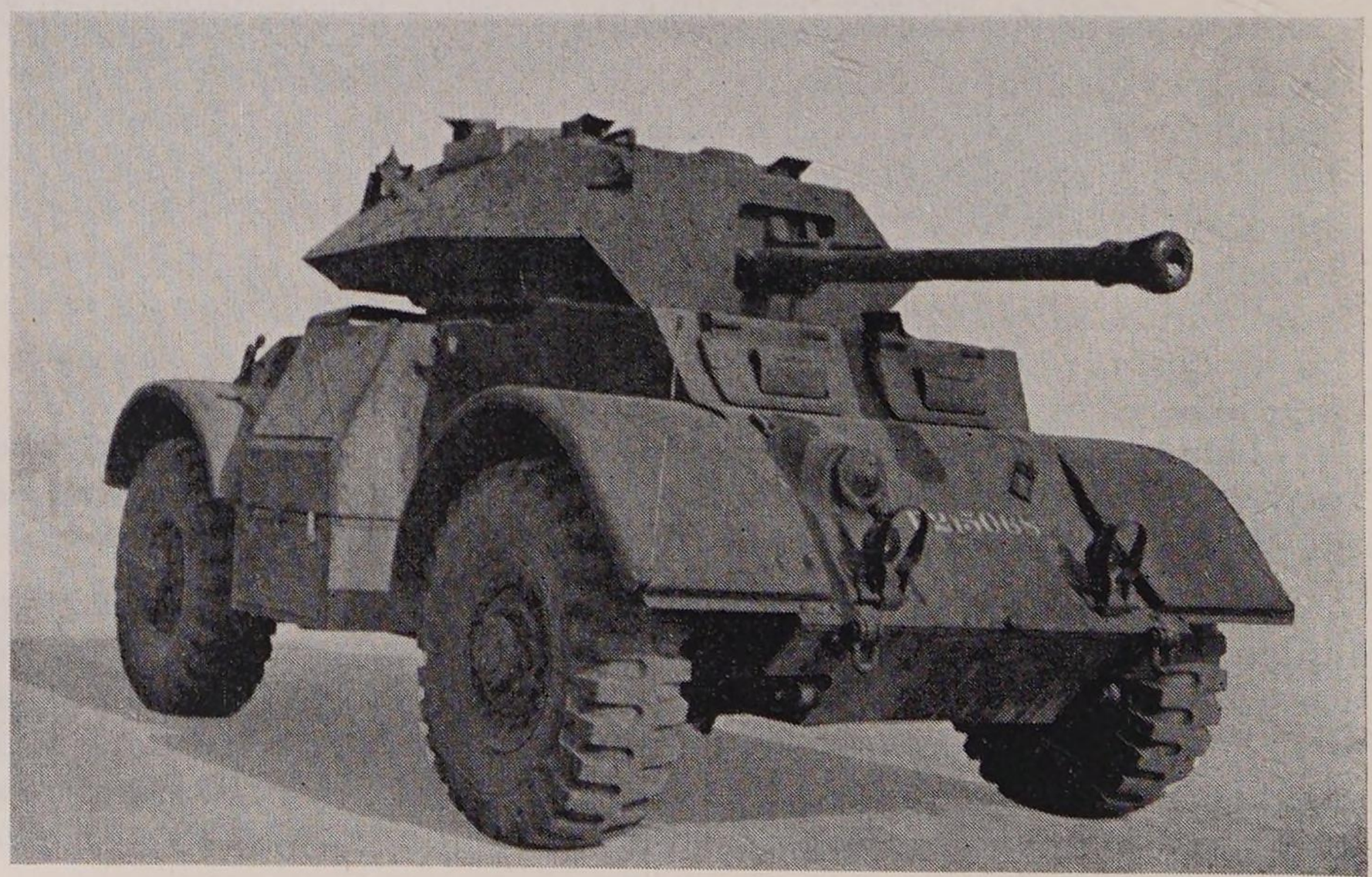
The Staghound saw action with the New Zealand Division in 1943, was also used by Indian Cavalry units and, in Italy, by the Reconnaissance Corps. Its most serious defect was lack of provision for driving in reverse. Built to British requirements, the car was powered by two Chevrolet engines each of 97 b.h.p. and had hydramatic transmission. The armanent was a 37 mm. gun and co-axial .30-in. Browning machine gun with periscopic sighting and another .30-in. Browning in the hull front.



*Staghound*
*Mark 1*
*1943*
*(T17E1)*

The main armament was stabilized in elevation and the turret traverse was hydraulic.

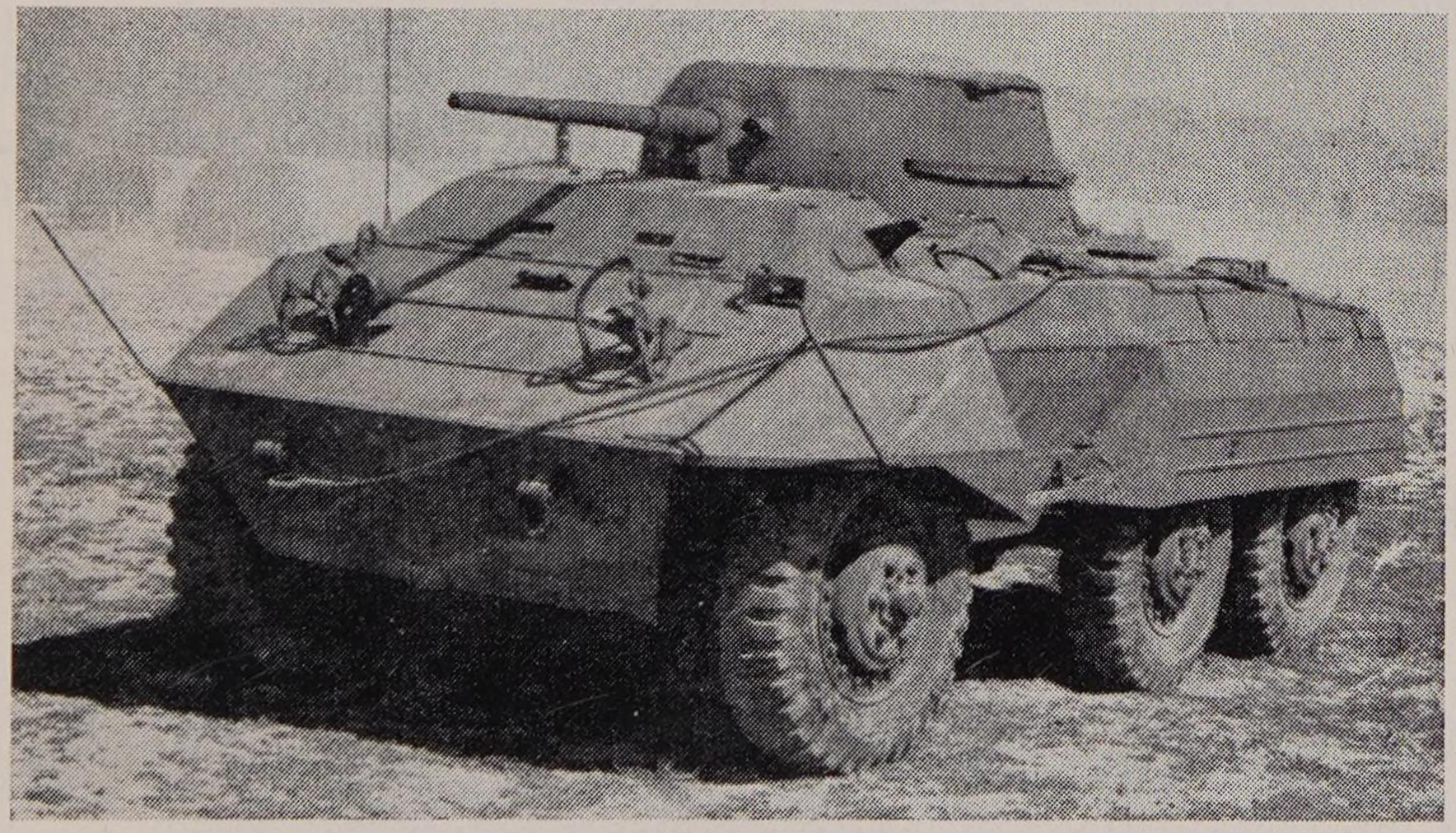
The car weighed nearly 12 tons with a crew of four. A certain number of Staghounds were fitted with 3-in. Howitzers and these became the Mark 2. A form of range adjuster was fitted between arms attached to the howitzer mounting and periscope bracket. The co-driver's compartment was used for ammunition stowage and the hull machine gun



*Staghound*
*Mark 3 1943*

removed. These cars were a stop-gap measure to give close HE and smoke support pending the arrival of the Mark 3 equipped with a 75 mm. gun. In the Mark 3 this gun was mounted in a British Crusader tank type turret with a co-axial 7.92 mm. Besa machine gun. The crew was reduced to three and the co-driver's compartment used for ammunition stowage with the hull machine gun removed and the aperture sealed with a welded plug.

The jettison fuel tanks, formerly carried on the outside of the vehicle, were replaced by stowage bins. The gun stabilizer was removed but the Logansport hydraulic pump retained to operate the power traverse and a British alternative hand traverse was also fitted.

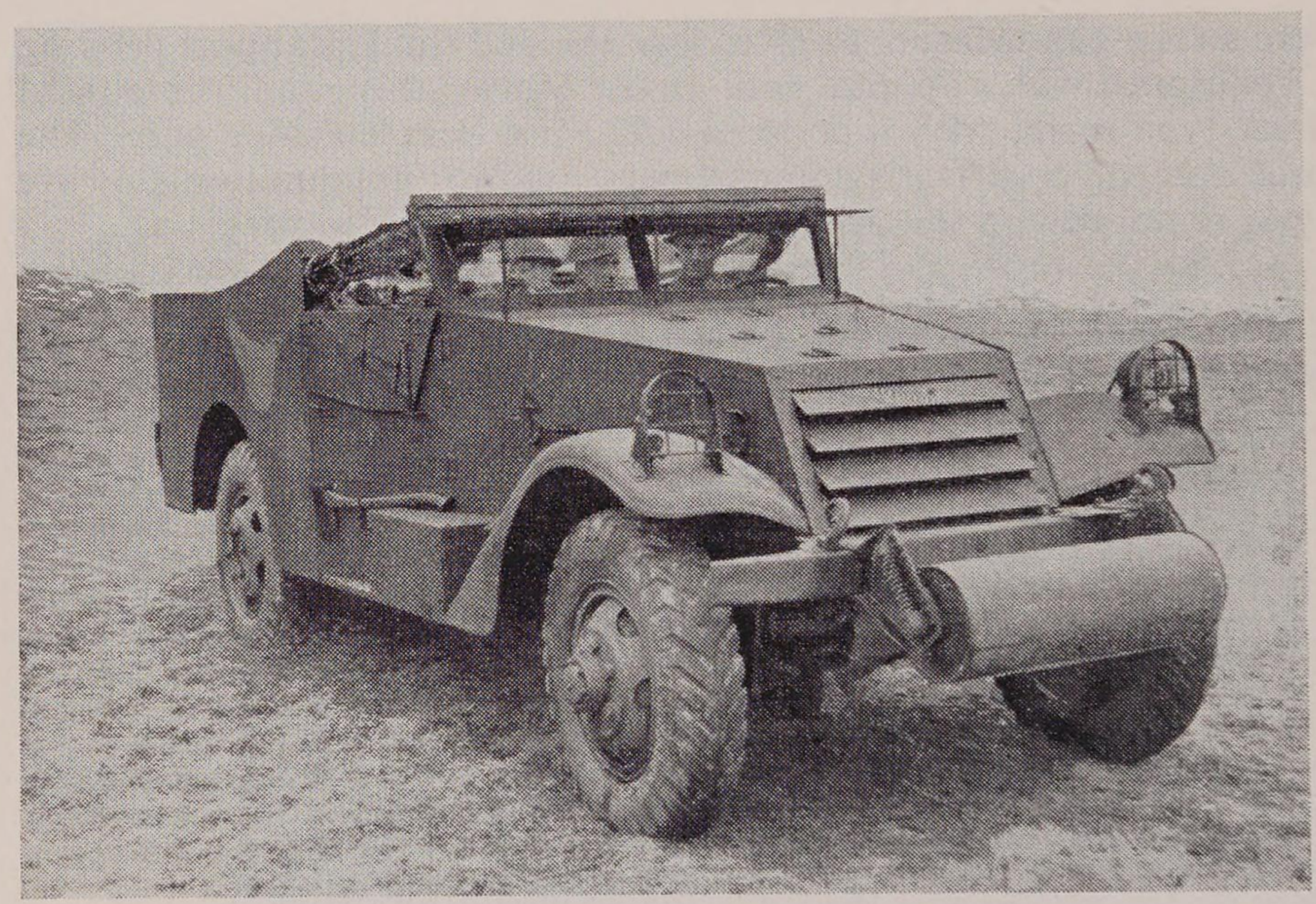


*Greyhound 1943 (LAC M8)*

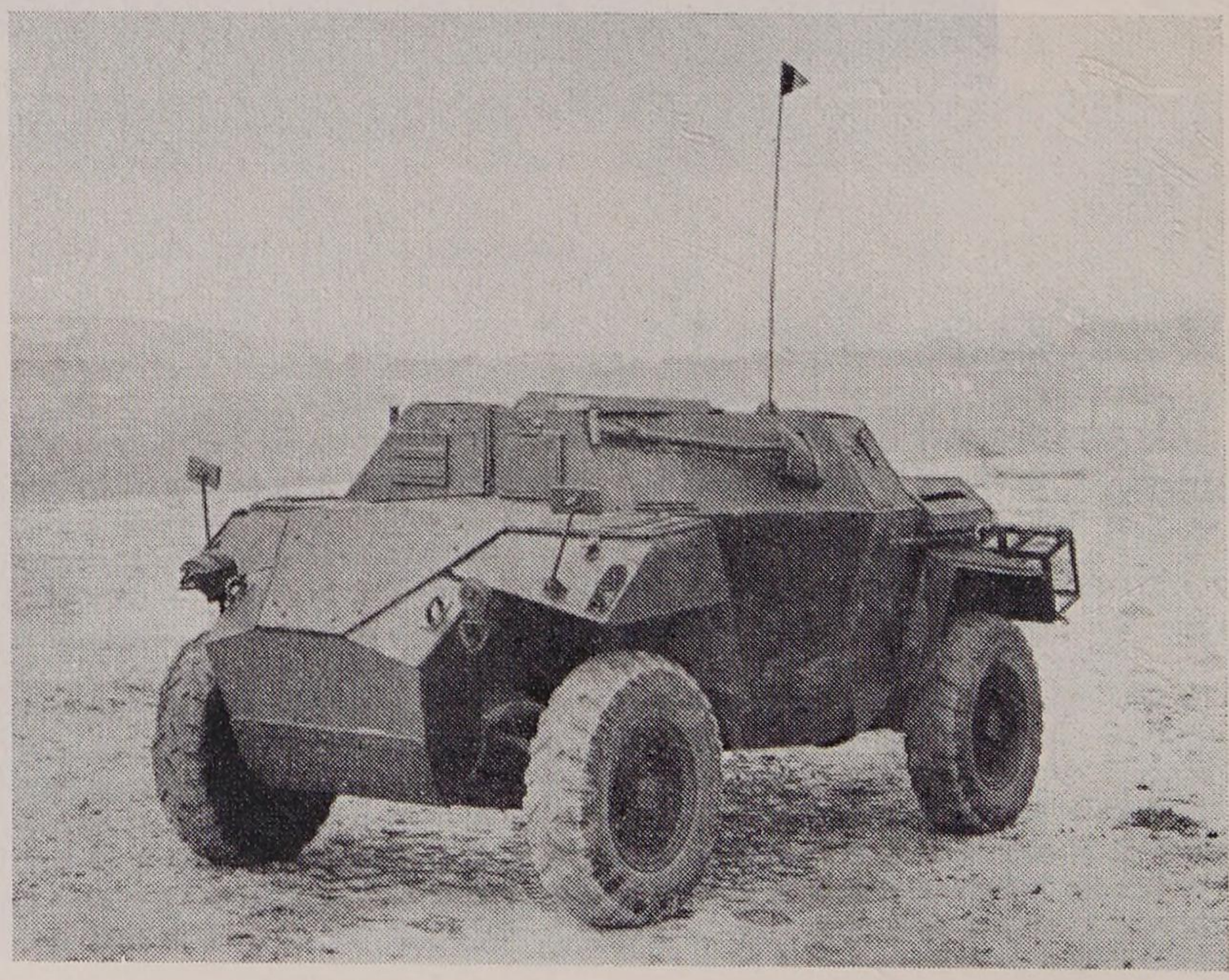
At the end of 1943 the American light armoured car M.8 came into service. This was known as the Greyhound. A low, fast and remarkably quiet car, the M.8 saw action in North East Europe and Italy in 1944-45. A few were used by British Armoured Car Regiments and the Reconnaissance Corps in Europe and by the East African Armoured Car Squadron.

It was a 6 x 6 vehicle mounting a 37 mm. gun and co-axial .30-in. Browning machine gun in an open top, hand traverse turret.

Powered by a 6 cylinder, Hercules JXD engine of 110 b.h.p. the car had a top road speed of 56 m.p.h. When the vehicle first arrived in the Middle East the floor was considered too thin to withstand mine blast and it became the practice to line the floor with filled sandbags. The maximum armour thickness was 25 mm.



*White Scout Car 1940-1945 (M3A1)*



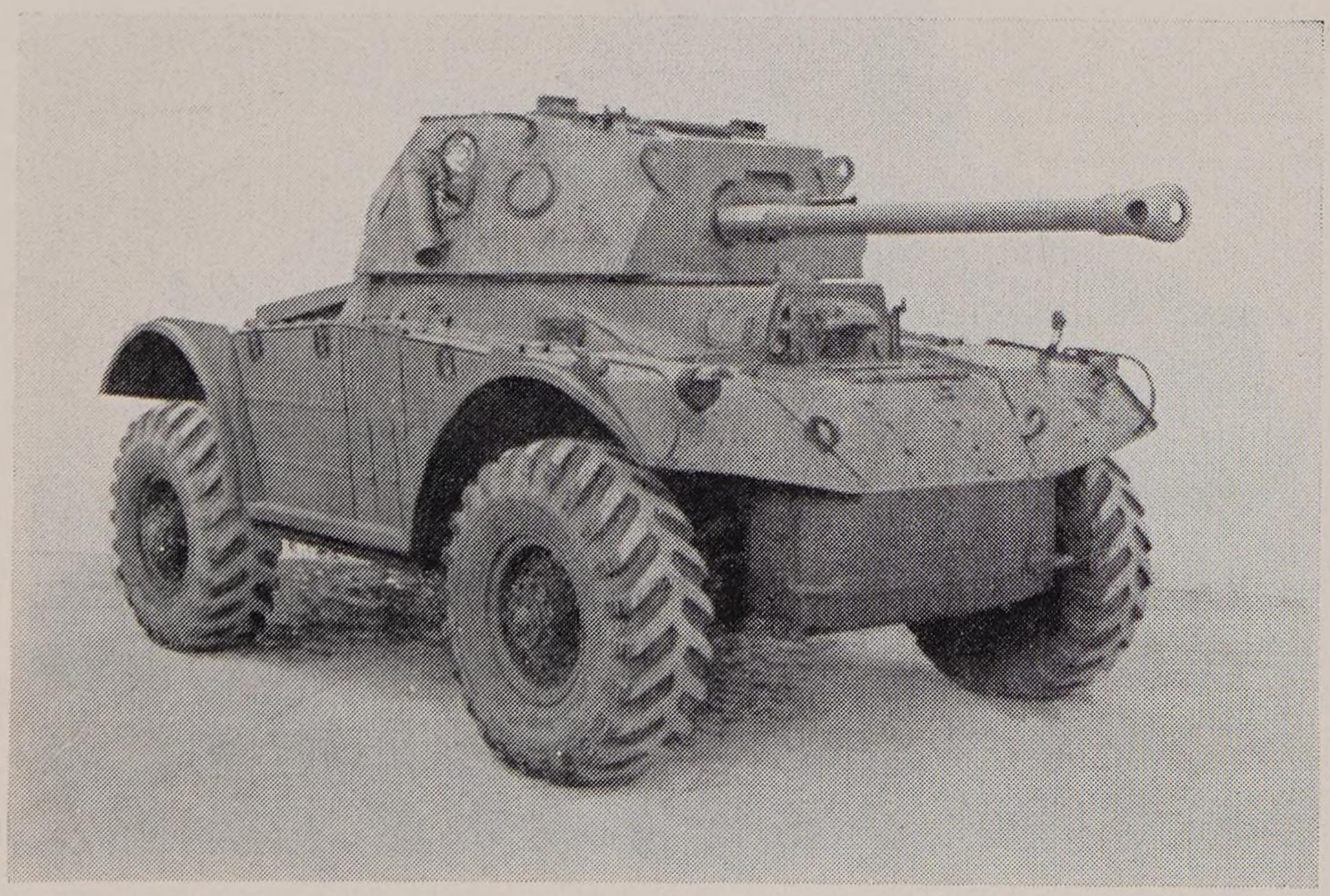
*Humber Scout Car 1943*

The White Scout Car was a large orthodox and robust 4 x 4 vehicle. It was open topped and was used in a variety of roles as a wheeled A.P.C., Reconnaissance Car and Recovery vehicle. In British units it was largely used as an armoured transport vehicle and by unofficial modifications frequently turned into a front line Regimental H.Q. It was useful, reliable and ubiquitous. There was also a half track derivative of the same car and this was most frequently used by British units for supply, recovery, and the carriage forward of L.A.D. personnel when the withdrawal of damaged vehicles was impossible under front line conditions.

Two Marks of the Humber scout car, similar to the Daimler in general design, were produced in 1943. The Mark 1 was a 4 x 4 vehicle with a crew of three. The armament was twin or single Bren LMG, roof mounted, with remote control from inside the car. The power unit was a Humber, 6 cylinder, 87 b.h.p. engine giving a road speed of 60 m.p.h. The transmission included synchromesh on third and top gears. The Mark 2 differed slightly in hull shape and had synchromesh additional on second gear.

These cars weighed $3\frac{1}{2}$ tons and were extensively used for a wide variety of reconnaissance and liaison duties by all armoured and many unarmoured units until the end of the war.

*Coventry*
*Mark 2*
*1944*



In 1944 a British heavy armoured car, generally similar to the Daimler but larger, was produced and this was called the Coventry.

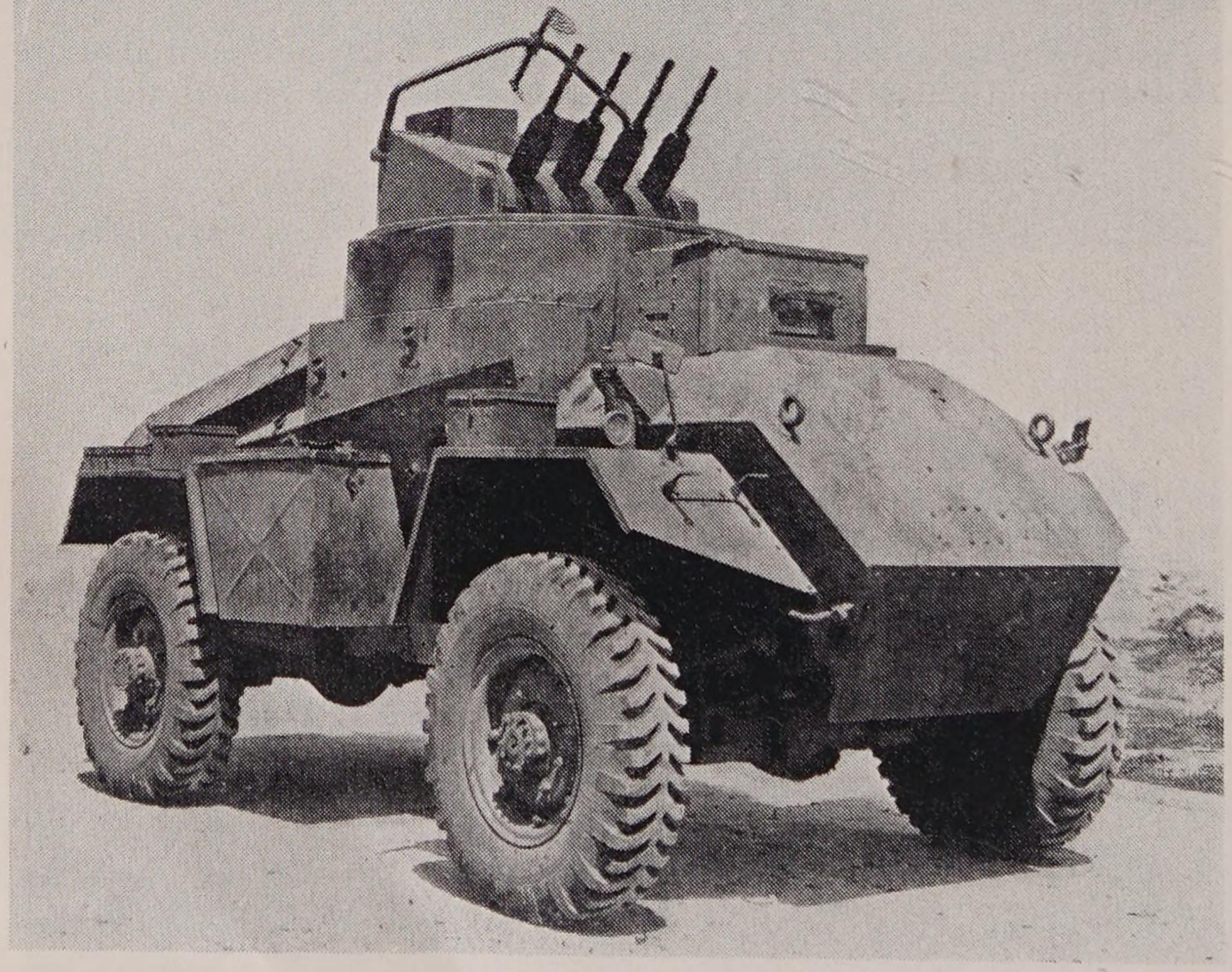
The design was a joint effort by Humber Ltd. and the Daimler Company. Two marks existed, the chief difference between them being in armament and crew. The Mark 1 was armed with a 2-pr. (40 mm.) gun and co-axial 7.92 Besa machine gun with a crew of four, whilst the Mark 2 carried a 75 mm. gun and crew of three. The engine was the

American Hercules, 6 cylinder of 175 b.h.p. which gave it a speed of 41 m.p.h. The armour was between 8-25 mm., with angled plates, and the weight 11½ tons.

High speed reversing, which had proved so valuable on the Daimler was included in the Coventry design. The principal driving controls were duplicated in the rear position and, by means of a forward/reverse gearbox the car could be driven in reverse in all five speeds.

The end of the war stopped production and the car never saw active service with the British Army.

A few were, however, used by the French Army after the end of the second World War.



*Humber*
*Mark 1*
*(Anti-aircraft)*

Reference has been made already to anti-aircraft protective armament for armoured and scout cars as individual vehicles.

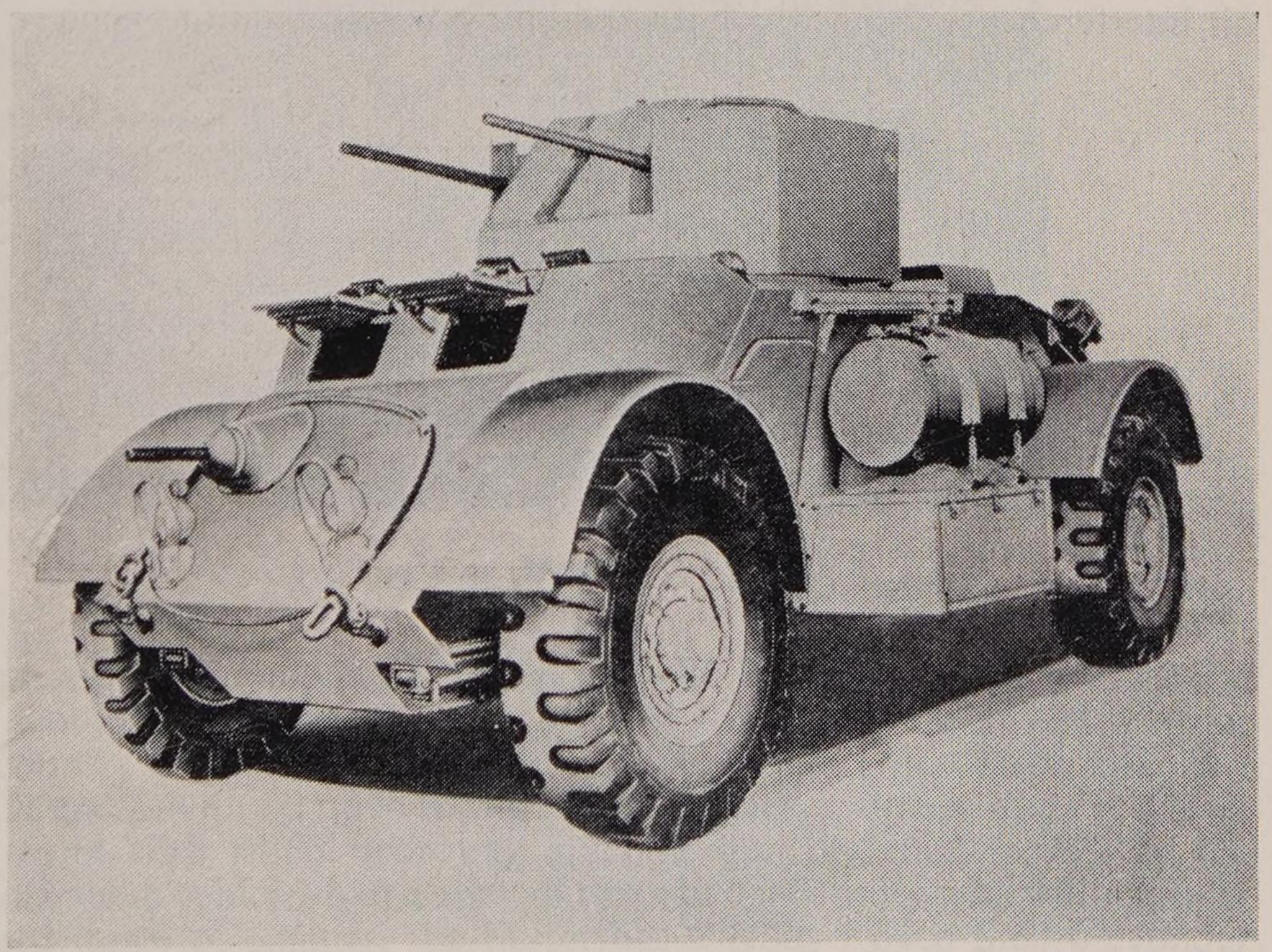
The problem of anti-aircraft defence had been given consideration in the early thirties, inconclusive experiments being carried out with a Rolls Royce car with a Scarfe ring mounting and a .303-in. Vickers machine gun on the top of the turret. But it was not until 1940 when battle experience had shown the extreme vulnerability of the largely road and

track bound cars of the day to low flying aircraft, that a serious attempt was made to provide adequate defence.

Initially this took the form of the anti-aircraft armoured car of which the first British version was a Humber.

The turret of a Mark 1 was removed and replaced by an armoured superstructure and a free traversing open topped turret with four 7.92 mm. Besa machine guns mounted together. The four guns fired simultaneously traverse and elevation being manually controlled.

A sight bar, extended across the turret and linked to the gun mounting, carried an anti-aircraft ring sight. A somewhat similar arrangement using twin Vickers "K" guns was also used on the Humber Mark 3 armoured car. There was also an anti-aircraft version of the Staghound armoured car using two .50-in. Browning machine guns in a hydraulically operated mounting with an illuminated sight adapted from naval equipment. The turret was open at the top and the front plate hinged to move with the guns. A vision slit in the front plates enabled the guns to be trained on ground targets.



*Staghound*
*(Anti-aircraft)*

Similarly it was intended to equip the Marmon-Herrington Mark 6 with a special anti-aircraft mounting with manual control and a ring sight. However experience showed that these special purpose anti-aircraft cars were not enough by themselves and that, in addition, every car should carry its own anti-aircraft armament. The Bren LMG readily

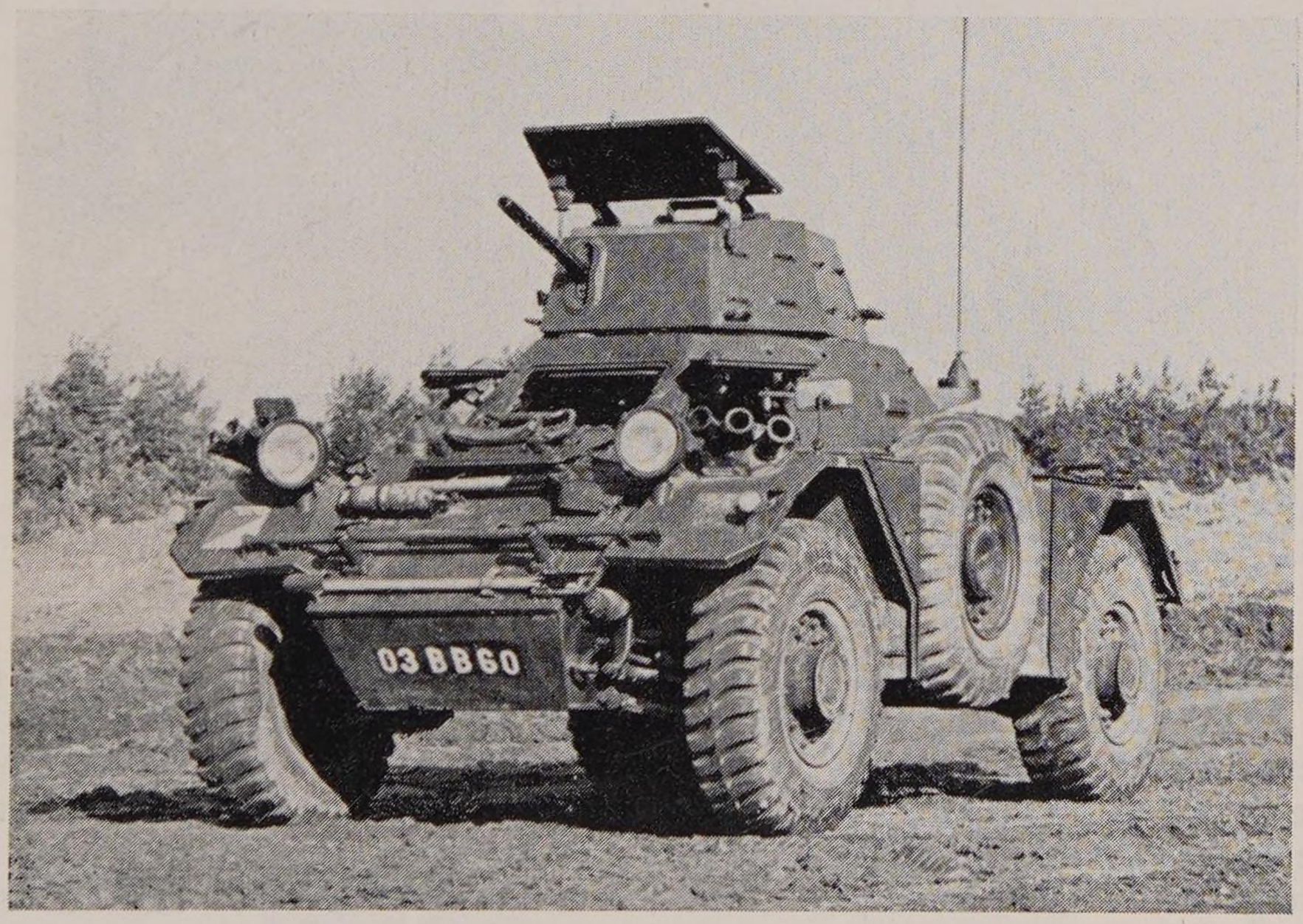
available in quantity was the selected weapon. A spring loaded supporting arm to take the Bren was designed for mounting on the turret together with the 100 type magazine to provide sustained fire. This arrangement gave little protection to the gunner and led to the development of the PLM mounting. This single or twin type gun mounting comprised a rotatable column pivoted on the turret with a rack connected to a handlebar control with firing levers mounted inside the turret on the roof plate. Movement of the handlebars actuated a train of gears to elevate or depress the gun cradle. The gunner thus had maximum protection coupled with operating efficiency and this arrangement became the standard anti-aircraft mounting on British armoured fighting vehicles during the second war.

A similar type of mounting using the Vickers gas operated "K" machine guns was used in 1943. Experiments were also carried out in the Middle East with a Daimler car having a high angle gun mounting and a special sight linkage outside the turret. Before these trials were completed the desert war had ended and allied air superiority in the European theatre was such that there was no longer the need for individual anti-aircraft defence for armoured fighting vehicles. This state of affairs had a profound influence on the successful conclusion of the war and gave the commanders and crews of armoured vehicles an immunity from air interference without which it would have been difficult to achieve the successes they did.

## DEVELOPMENT AFTER 1945

After the end of World War II British policy was directed towards the development of the armoured scout car for liaison and reconnaissance roles and an armoured car with an improved cross country performance and carrying a heavier dual purpose armament. This policy was based upon the success of these types of car during the second war.

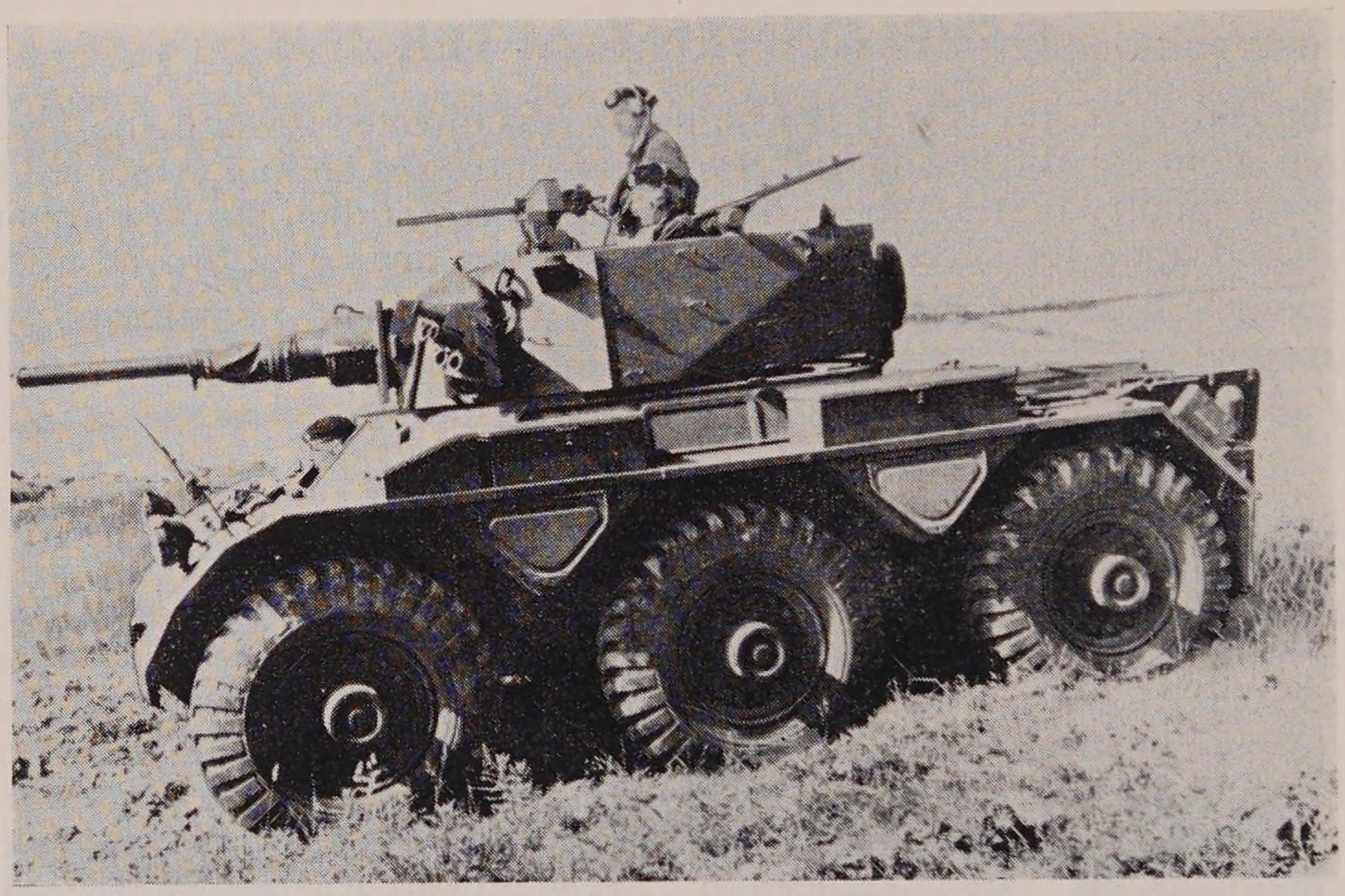
To achieve this aim special vehicles were developed and no attempt was made to adapt commercial vehicle chassis.




*Ferret Scout Car Mark 2*

The Daimler Company developed the Ferret Scout Car. This followed the general layout of the wartime scout car made by the firm but was lower, faster and had a better suspension and cross country performance. There are two distinct types based upon the same hull. The Ferret Mark 1, with an open top designed for liaison duties, and the Ferret Mark 2, mounting a turret with a .30 Browning machine gun designed for use in the reconnaissance role. Both these vehicles had a crew of two. In conformity with the post-war policy for a standardized range of engines, the Ferret has a Rolls Royce B.60 6 cylinder engine of 120 b.h.p. The Mark 1 weighs about $3\frac{1}{2}$ tons and the Mark 2 about 4 tons; both have a top speed approaching 60 m.p.h.

The Saladin is manufactured by Alvis Ltd. This is an 11 ton vehicle mounting a 76 mm. medium velocity gun with a co-axial .30 Browning machine gun in a turret, providing 360° powered traverse. The 76 mm. gun is a dual purpose weapon with an anti-tank



*Saladin Armoured Car*

and general purpose HE capability. An excellent cross country performance is provided by the six evenly spaced wheels, all of which are driven. The leading four wheels are power steered and the suspension is by longitudinal torsion bars with wishbone type arms. The engine is the Rolls Royce B.80 straight eight, using common components with the rest of the Rolls Royce "B" series engines. This develops 160 b.h.p., giving the vehicle a power/weight ratio of 14.5 b.h.p./ton and a maximum speed of 45 m.p.h. In terms of a combination of fire power, mobility and armour protection this is probably one of the most powerful armoured cars which has gone into production.

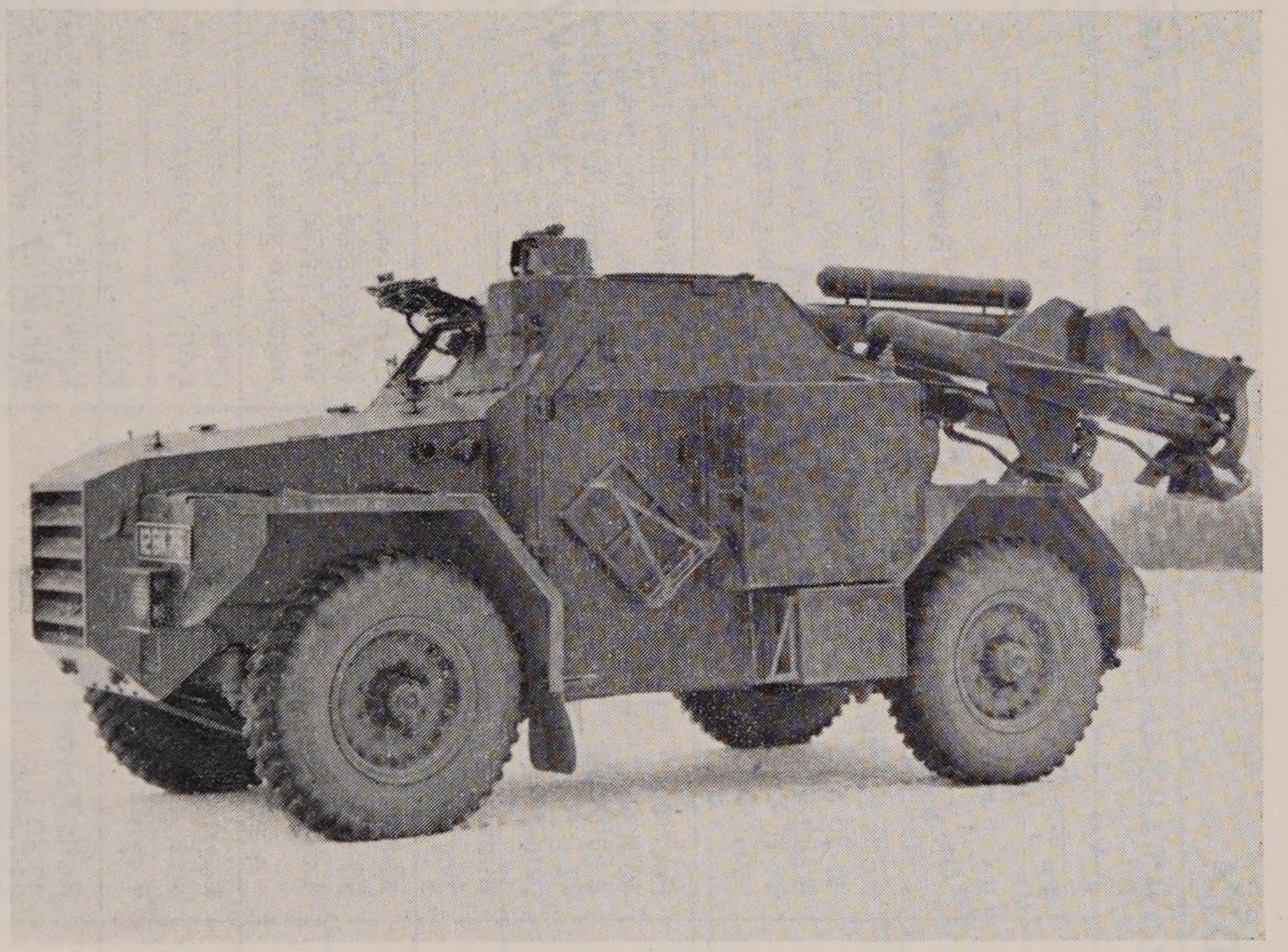
The Hornet was produced to provide a heavy anti-tank capability on a vehicle light enough to be used by the Royal Armoured Corps in support of airborne operations and is therefore air portable. It carries the Malkara anti-tank guided missle which is capable of destroying the heaviest tanks at long ranges.

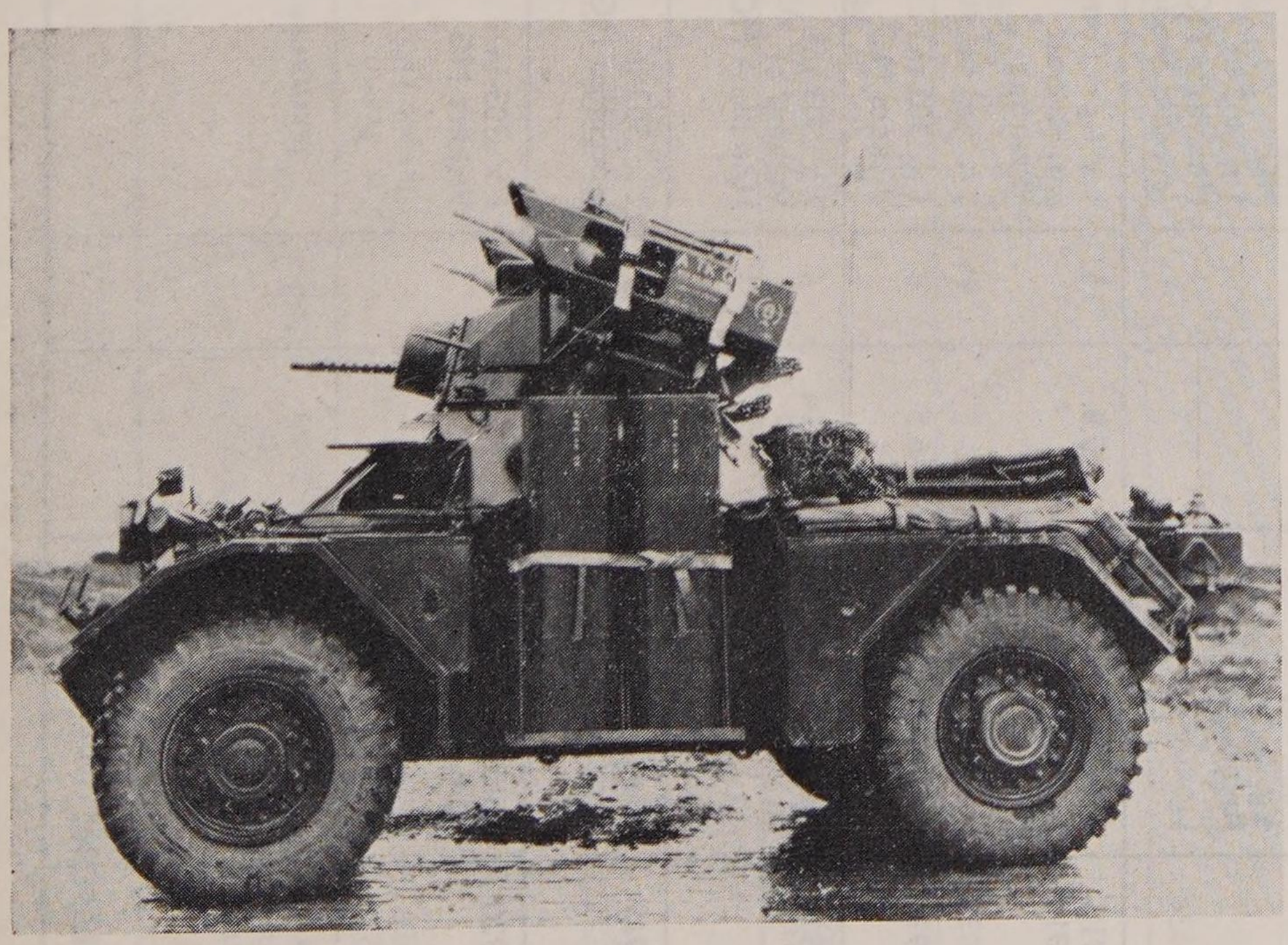
The vehicle is based upon the FV 1601 APC which was in turn based on the chassis of the FV 1600 one ton combat truck. This was produced by Humber Ltd. and is a 4 x 4 all independently sprung wheel chassis fitted with the Rolls Royce B.60 engine.

The Hornet is fully armoured and has a battle weight of 6 tons. The arms carrying the missile are raised hydraulically to the launch position. The vehicle has a crew of three.

To improve the anti-tank capability of the reconnaissance vehicle the Ferret Mark 2 has been fitted with four Vigilant anti-tank, guided weapons mounted on the turret. In all other respects it is a standard Ferret Mark 2.

*Hornet GW*
*Launcher Vehicle*





*Ferret Scout Car*
*Mark 2*
*fitted with GW*

# APPENDIX

## COMPARATIVE TABLE OF ARMOURED, SCOUT AND RECONNAISSANCE CARS USED BY THE BRITISH ARMY

| Date in Service | Type | Weight in tons | Crew | Armament | Engine | Road Speed in m.p.h. | Max. Armour in mm. | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1914 | Rolls Royce 4 x 2 Armoured Car | 3.5 | 3 | 1 x .303-in. Vickers MG<br>1 x .303-in. Hotchkiss MG (ground mounting) | Rolls Royce 40-50 h.p. 6 cylinder | 60 | 7 | Similar bodies and armament also used on Lanchester, Delauny - Belville and Talbot chassis. |
| 1915-1916 | Peerless 4 x 2 Armoured Lorry | 5.8 | 5 | 1 x 1-pr. Pom-Pom anti-aircraft mounting | Peerless 40 h.p. 4 cylinder | 18 | 8 | Body by Wolseley Motor Co. Ltd. on imported commercial chassis. Similar body also used on Pierce-Arrow chassis. |
| 1917 | Jeffery Quad | 6.5 | 3 | 1 x .303-in. Vickers MG | Buda 40 h.p. | 20 | 8 | |
| 1918 | Austin 4 x 2 Armoured Car | 4.14 | 4 | 2 x .303-in. Vickers or Hotchkiss MG | Austin 50 h.p. 4 cylinder | 35 | 8 | Cars used by 17th Tank (Armoured Car) Battalion were fitted with Hotchkiss machine guns. |
| 1919 | Peerless 4 x 2 Armoured Car | 6.9 | 4 | 2 x .303-in. Hotchkiss MG | Peerless 40 h.p. 4 cylinder | 18 | 10 | |
| 1920 | Rolls Royce 4 x 2 Armoured Car | 3.5 | 3 | 1 x .303-in. Vickers MG | Rolls Royce 40-50 h.p. 6 cylinder | 60 | 10 | Identical with 1914 pattern except for protective wheel discs and higher turret sides. The 1924 pattern was also the same except for the provision of vision slits in the hull, a different shaped turret with a cupola and different wheels. The 1921 Indian pattern only differed in having a body similar to the Crossley 4 x 2 of 1923. |

**APPENDIX** (continued)

| Date in Service | Type | Weight in tons | Crew | Armament | Engine | Road Speed in m.p.h. | Max. Armour in mm. | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1923-1925 | Crossley 4 x 2 Armoured Car (Indian Pattern) | 5 | 4 | 2 x .303-in. Vickers MG | Crossley 50 h.p. 4 cylinder | 40 | 8 | Three variants of the design with minor differences were produced in the 3 years. The same hull used on a Chevrolet chassis in India after 1939. |
| 1928 | Vickers-Guy 6 x 4 Armoured Car (Indian Pattern) | 9 | 4 | 2 x .303-in. Vickers MG | Guy 120 b.h.p. 6 cylinder | 40 | 10 | Body by Vickers Ltd. on Guy 6 x 4 chassis. |
| 1930-1935 | Crossley 6 x 4 Armoured Car | 6.5 | 3 | 1 x .303-in. Vickers MG Mark 4<br>1 x .303-in. MG in hull | Crossley 50 h.p. 4 cylinder | 40 | 9 | |
| 1932 | Lanchester 6 x 4 Armoured Car | 7.5 | 4 | 2 x .303-in. and 1 x .5-in. Vickers MG | Lanchester 45 h.p. 6 cylinder | 45 | 10 | There was a Mark 1, 1A, 2 and 2A. The differences were slight and mainly in cooling, carburation and cupola design. |
| 1939 | Morris 4 x 2 Light Armoured Reconnaissance Car | 4.2 | 3 | 1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle | Morris 70 h.p. 4 cylinder | 46 | 8-14 | |
| 1939 | Daimler 4 x 4 Scout Car | 3.1 | 2 | 1 x .303-in. Bren LMG | Daimler 70 h.p. 6 cylinder | 59 | 3-30 | |
| 1939 | Guy 4 x 4 Armoured Car (wheeled tank) | 5.75 | 3 | 1 x .303-in. and 1 x .5-in. Vickers MG | Meadows 61 b.h.p. 6 cylinder | 35 | 8-15 | Mark 1A fitted with 15 mm. and 7.92 mm. Besa machine guns. |

**APPENDIX** (continued)

| Date in Service | Type | Weight in tons | Crew | Armament | Engine | Road Speed in m.p.h. | Max. Armour in mm. | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1940-1943 | Marmon-Herrington 4 x 2 and 4 x 4 Marks 2, 3, 4 and 6 | 6.5 | 3 | *Marks 2 and 3*<br>1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle<br>*Mark 4*<br>1 x 2-pr. QFSA gun<br>2 x .30-in. Browning MG<br>*Mark 6*<br>1 x 2- or 6-pr. gun<br>2 x .30-in. Browning MG | Ford 95 b.h.p. V.8 | 40 | 8-12 | Built in South Africa and designated S.A. Recce cars by U.D.F. Marks 2-4 only issued to British units. Marks 6, 7, 8 never in production. |
| 1940 | Standard 4 x 2 Beaverette light Reconnaissance Car | 2-2.5 | 3 | 1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle | Standard 14 h.p. 6 cylinder | 24-40 | 8-10 | Marks 1 and 2 with open top. Marks 3 and 4 enclosed with turret and heavier. |
| 1940 | Humberette 4 x 2 light Armoured car | 2.6 | 3 | 1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle | Humber 87 b.h.p. 6 cylinder | 50 | 8-10 | Similar to later Ironside Mark 1. |
| 1940-1941 | Daimler 4 x 4 Armoured Car Marks 1 and 2 | 7.5 | 3 | 1 x 2-pr. QFSA gun<br>1 x 7.92 mm. Besa MG | Daimler 95 h.p. 6 cylinder | 50 | 14 | The Mark 2 differed mainly in type of gun mounting, driver's escape hatch and engine covers. |
| 1940-1945 | White 4 x 4 or half track scout car | 3.9 | Crew 2 carrying capacity 8-12 men | 1 x .30-in. Browning MG<br>1 x .50-in. Browning MG | White 48 b.h.p. 6 cylinder | 45 | 5-8 | Used as an A.P.C. by Motor Battalions in Armoured Divisions and as general purpose armoured vehicle in all armoured and some un-armoured units. |

**APPENDIX** (continued)

| Date in Service | Type | Weight in tons | Crew | Armament | Engine | Road Speed in m.p.h. | Max. Armour in mm. | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1941-1943 | Humber 4 x 4 Armoured Car Marks 1, 2 3 and 4 | 6.17 | 3-4 | 1 x 15 mm. Besa MG<br>1 x 7.92 mm. Besa MG | Humber 90 b.h.p. 6 cylinder | 45 | 8-14 | The Mark 4 had a 37 mm. gun and co-axial 7.92 mm. Besa MG. |
| 1941-1943 | Humber 4 x 2 light Reconnaissance car. Marks 1, 2 and 3 | 3.8 | 3 | 1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle | Humber 87 b.h.p. 6 cylinder | 70 | 14 | Sometimes known as Ironsides. Marks 1 and 2 were 4 x 2, Mark 3 was 4 x 4. |
| 1941 | Morris 4 x 2 light Reconnaissance Car. Marks 1 and 2 | 3.6 | 3 | 1 x .303-in. Bren LMG<br>1 Boys anti-tank rifle | Morris 70 h.p. 4 cylinder | 50 | 8-14 | When fitted with wireless the Boys rifle was not carried. The Mark 2 was 4 x 4. |
| 1942 | A.E.C. 4 x 4 Armoured Car Marks 1, 2 and 3 | 11-12 | 3-4 | 1 x 2-pr. QFS gun<br>1 x 7.92 Besa MG | A.E.C.105 or 165 b.h.p. 6 cylinder Diesel | 42 | 25 | The Mark 2 was equipped with a 6-pt. gun and crew of 4. The Mark 3 with 75 mm. gun and crew of 4. |
| 1943 | Humber 4 x 4 Scout Car | 3.5 | 2-3 | 1 x .303-in. Bren LMG | Humber 87 h.p. 6 cylinder | 59 | 4-14 | |
| 1943 | Staghound 4 x 4 Armoured Car Marks 1, 2 and 3 | 12-13.6 | 3-4 | 1 x 37 mm. QFSA gun<br>2 x .30-in. Browning MG | Two Chevrolet 176 b.h.p. 6 cylinder | 50 | 12-32 | Mark 2 fitted with 3-in. Howitzer. Crew 3. Mark 3 fitted with 75 mm. gun, Crew 3. |
| 1943 | Greyhound 6 x 6 Armoured Car | 7.6 | 4 | 1 x 37 mm. QFSA gun<br>1 x .30-in. Browning MG | Hercules J x D 110 b.h.p. 6 cylinder | 55 | 25 | American Light Armoured Car M8. |

**APPENDIX** (continued)

| Date in Service | Type | Weight in tons | Crew | Armament | Engine | Road Speed in m.p.h. | Max. Armour in mm. | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1944 | Coventry 4 x 4 Armoured Car Marks 1 and 2 | 11.52 | 4 | 1 x 2-pr. QFSA gun<br>1 x 7.92 mm. Besa MG | Hercules 135 b.h.p. 6 cylinder | 41 | 8-25 | Mark 2 fitted with 75 mm. gun. Crew 3. |
| 1951 | Ferret 4 x 4 Scout Car | Mark 1 3.5<br>Mark 2 4 | 2<br>2 | 1 x .30-in, Browning MG | Rolls Royce B.60 120 b.h.p. | 58 | — | Mark 2 fitted with turret. |
| 1958 | Saladin 6 x 6 Armoured Car | 11.1 | 3 | 1 x 76 mm. QF gun<br>1 x .30-in. Browning MG | Rolls Royce B.80 160 b.h.p. | 45.5 | — | |
| 1963 | Hornet G.W. Launcher Vehicle | 6 | 3 | 4 x Malkara anti-tank guided missles | Rolls Royce B.60 120 b.h.p. | 50 | — | Based on FV1600 one ton combat truck. |

# SUPPLEMENT

## FOREIGN ARMOURED CAR DEVELOPMENT

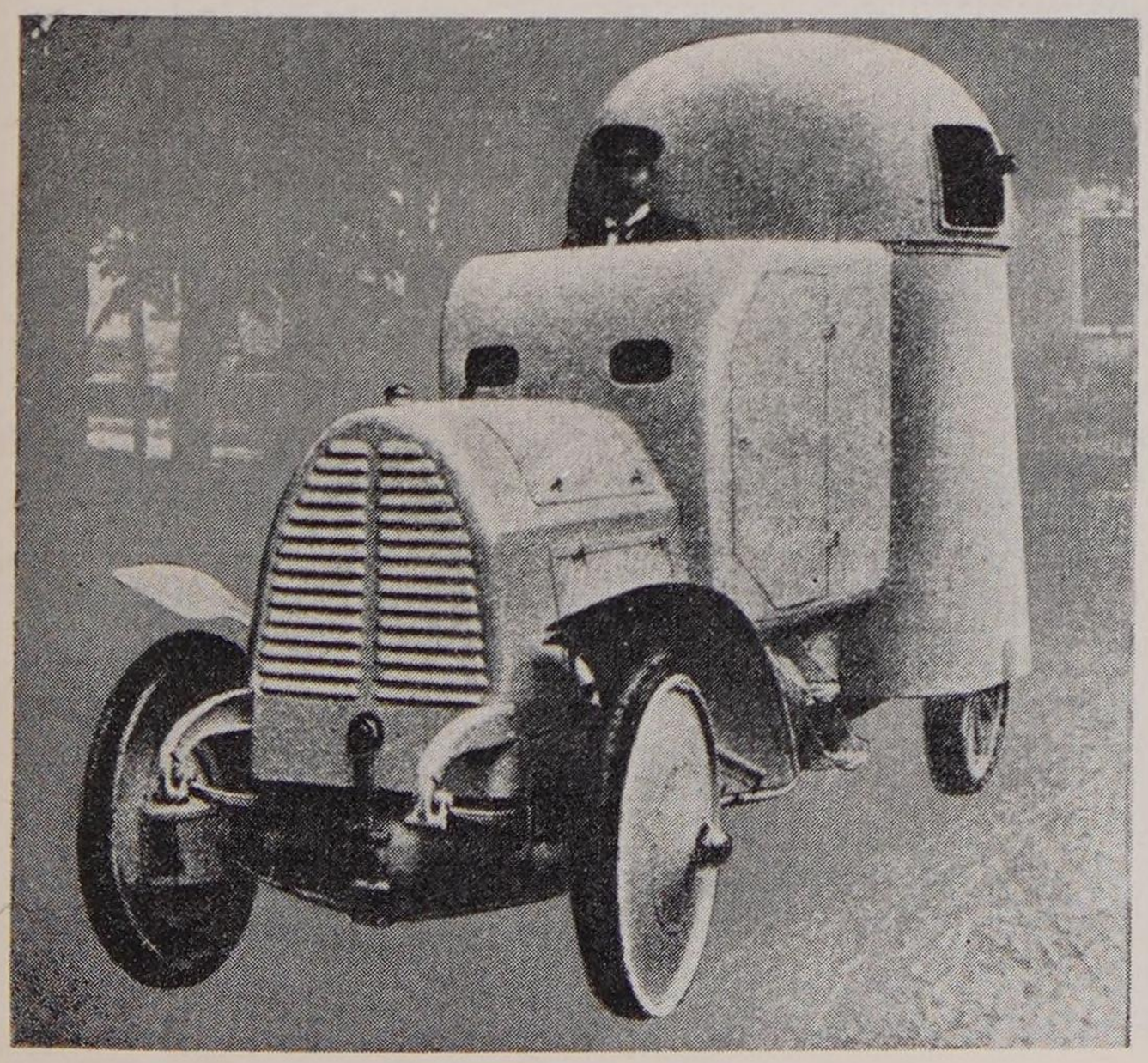
### General

This brief supplement is intended to give a broad background of foreign development against which the reader can assess the British development already described. It is therefore not comprehensive and, although developments in most of the major producing countries are described, not all countries who produced or used armoured cars are given. Similarly space does not permit the same amount of detail as has been given to descriptions of British designs or American designs used by the British Army.

### Introduction

Prior to the outbreak of the first World War armoured car development abroad followed the same general lines as in Great Britain.

There was a three wheeled vehicle produced in America in 1899 which was fitted with a Colt machine gun protected by a shield and in 1900 two experimental steam driven cars carrying guns were produced. In France, in December 1902, a touring car chassis was equipped with a Hotchkiss machine gun, with all round armour protection, mounted behind the driver, and between 1903-1906 a fully armoured car, again on a touring chassis, was tested by the French Army.



*Austro-Daimler*
*Armoured Car 1904*

In Austria, at about the same time, a similar fully armoured car was built by the Austro-Daimler company. Both this and the French car mounted machine guns in traversing turrets, and the Austrian car had four wheel drive. Apart from this most other development concerned experiments with unarmoured cars mounting guns, although there was a German anti-ballon car equipped with a 50 mm. gun in use in 1906 and an armoured body was put on an Italian Fiat truck chassis in 1912.

## The First World War

Development speeded up after 1914 and armoured cars were built in France, Belgium and Germany. As in Great Britain these were mostly open top, armoured bodies mounted on commercial chassis such as Renault, Peugeot and Minerva. Their operational use was so limited after the onset of trench warfare in Europe that they could only be usefully employed in theatres permitting mobile operations such as Russia and the Middle East. Even so the number of armoured cars used was comparatively small. For example the French Army had under 300 in 1918 and most of these were based on the American White truck chassis.

The Russian Army, which used, amongst others, the British built Austin had the largest number of armoured cars in service, just under 500. Germany built a small number of armoured cars between 1914-1918. These, unlike their contemporaries, were all heavy, solid tyred machines weighing between 9 and 10 tons. As some compensation for this unwieldy weight the German Daimler and Bussing drove on all wheels and an Ehrhardt model of 1915 also had four wheel steering in addition.

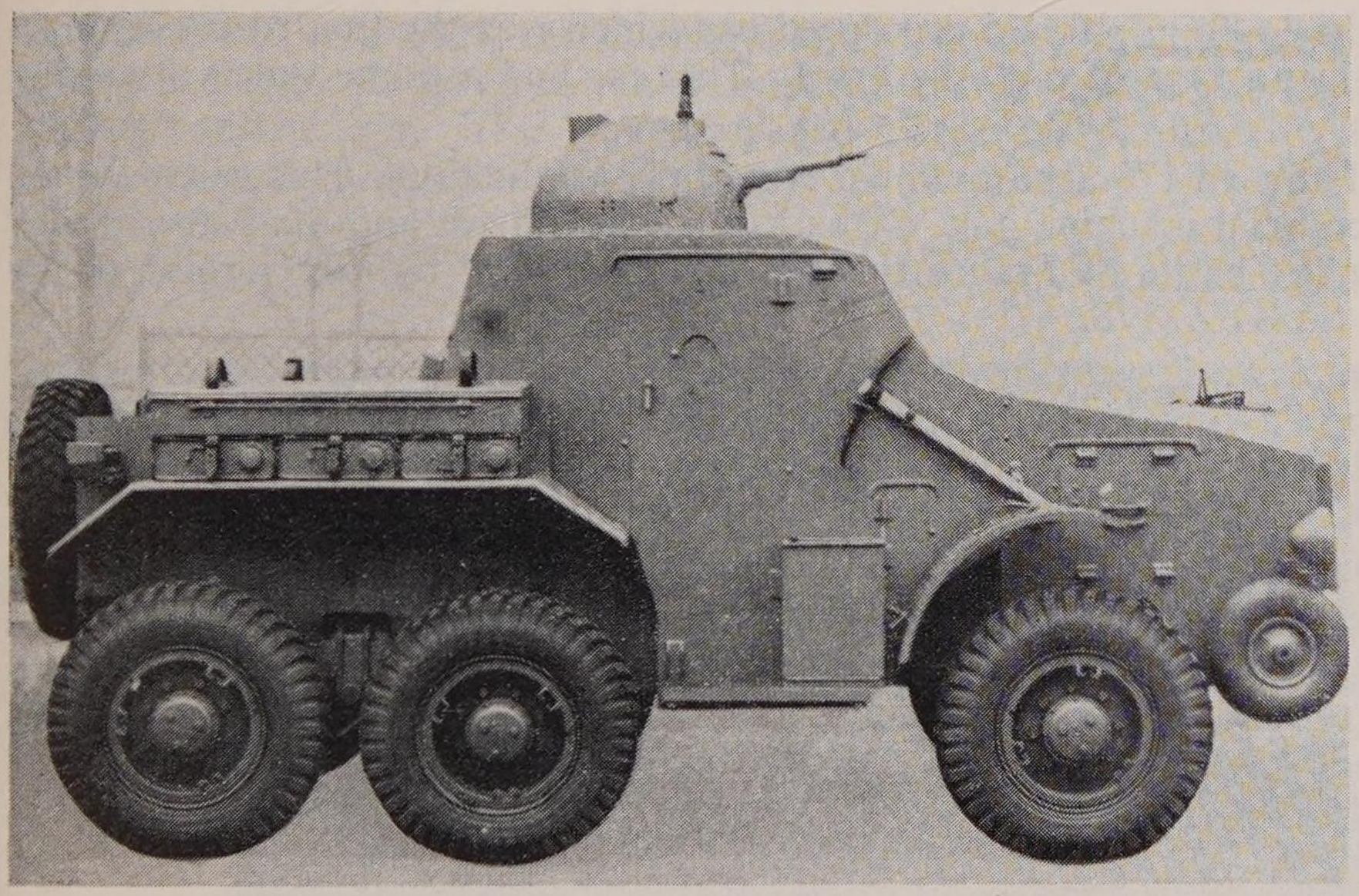
Most of these cars were armed with machine guns although the French did use some with 37 mm. guns and one Russian car of 1917 carried a 76 mm. gun mounted on an American Garford truck chassis.

## Between the Wars

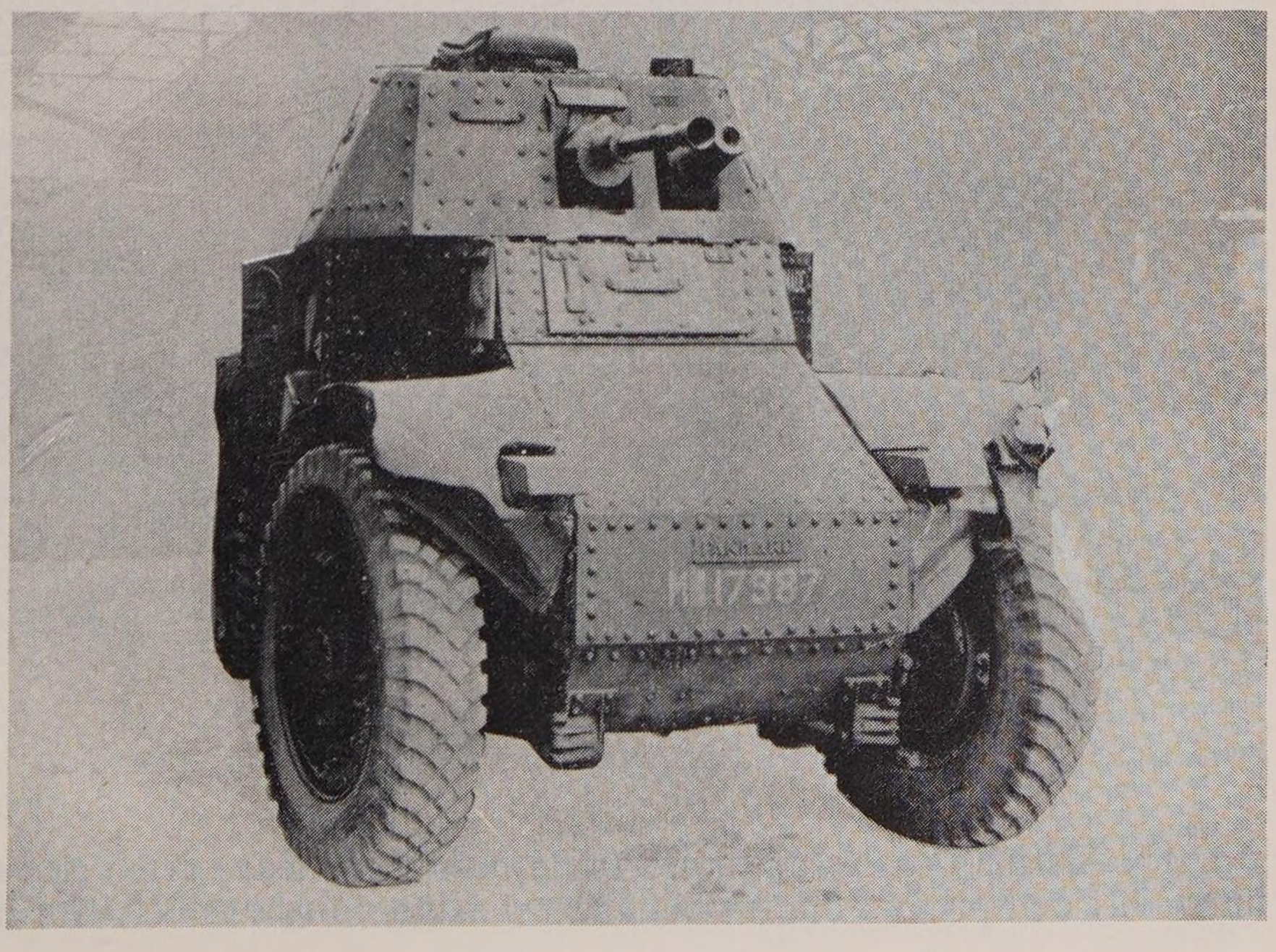
There was a steady trend of armoured car development on the Continent between 1920 and 1938 which was mostly directed to vehicles suitable for reconnaissance purposes.

In France, initially, this took the form of improving the performance of the conventional vehicle by the use of rubber tracks in place of the rear wheels. This was the invention of A. Kégresse and had been tried out in 1917 in Russia. The development was taken up by Citröen and Schneider between 1921 and 1925 and resulted in the production of half track armoured cars on a Citröen Kégresse chassis with an armoured body made by Schneider and known as the P16. The engine used was a Panhard 15 CV. The emphasis on this type of development slackened in France after 1930 but work did not stop entirely and a half track car, with turret, was produced by SOMUA in the late thirties on a commercial chassis.

Another French design was the Berliet experimental armoured car produced in 1927 with three, evenly spaced, driven axles. Under test it proved too heavy and was not proceeded with although experimental work continued as late as 1933. However, this was the forerunner of post second world war French 8 x 8 development described later. Between



*French Laffly S15*
*1935-1937*



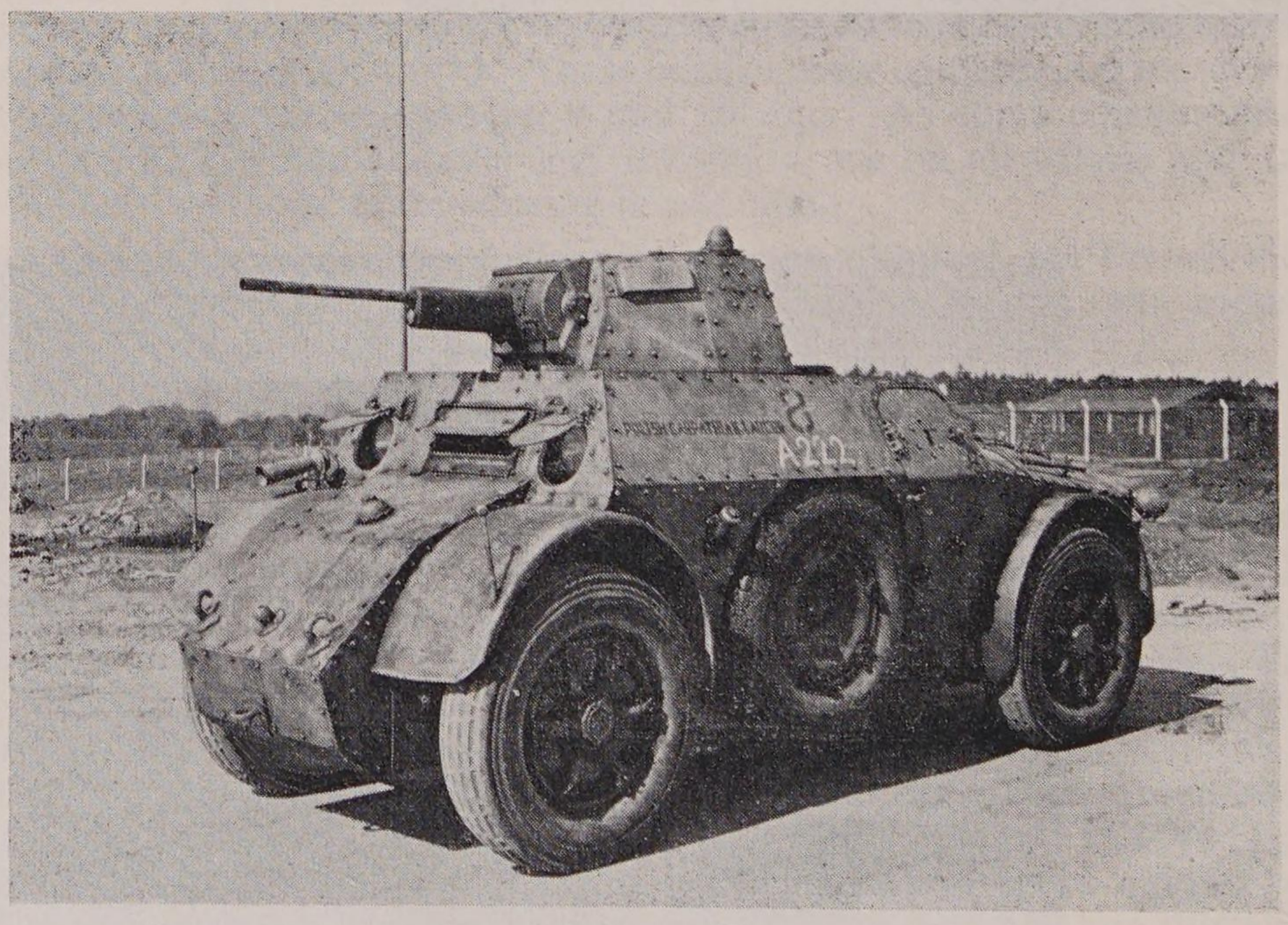
*French*
*Panhard 178 1935*

1935 and 1937 came the Laffly 6 x 6 S15 armoured car which was the first to use a single central differential with this type of multiple drive. This car had a dome turret mounting a 7.5 mm. gun.

Also in 1935 the Panhard 178 armoured car went into production. This car mounted a 25 mm. gun and a co-axial machine gun. It had four wheel drive and dual steering for reverse driving. After the battle of France this machine was used by the German Army under the designation Sd.KFZ. 178.

Similar experimental work went on in Italy, though to a lesser degree, and resulted in an adaptation of the Pavesi wheeled tractor which was based on an articulated chassis and large diameter all driven wheels with solid tyres. Nothing came of the armoured car experimental work but the tractor itself became an artillery prime mover in the Italian Army.

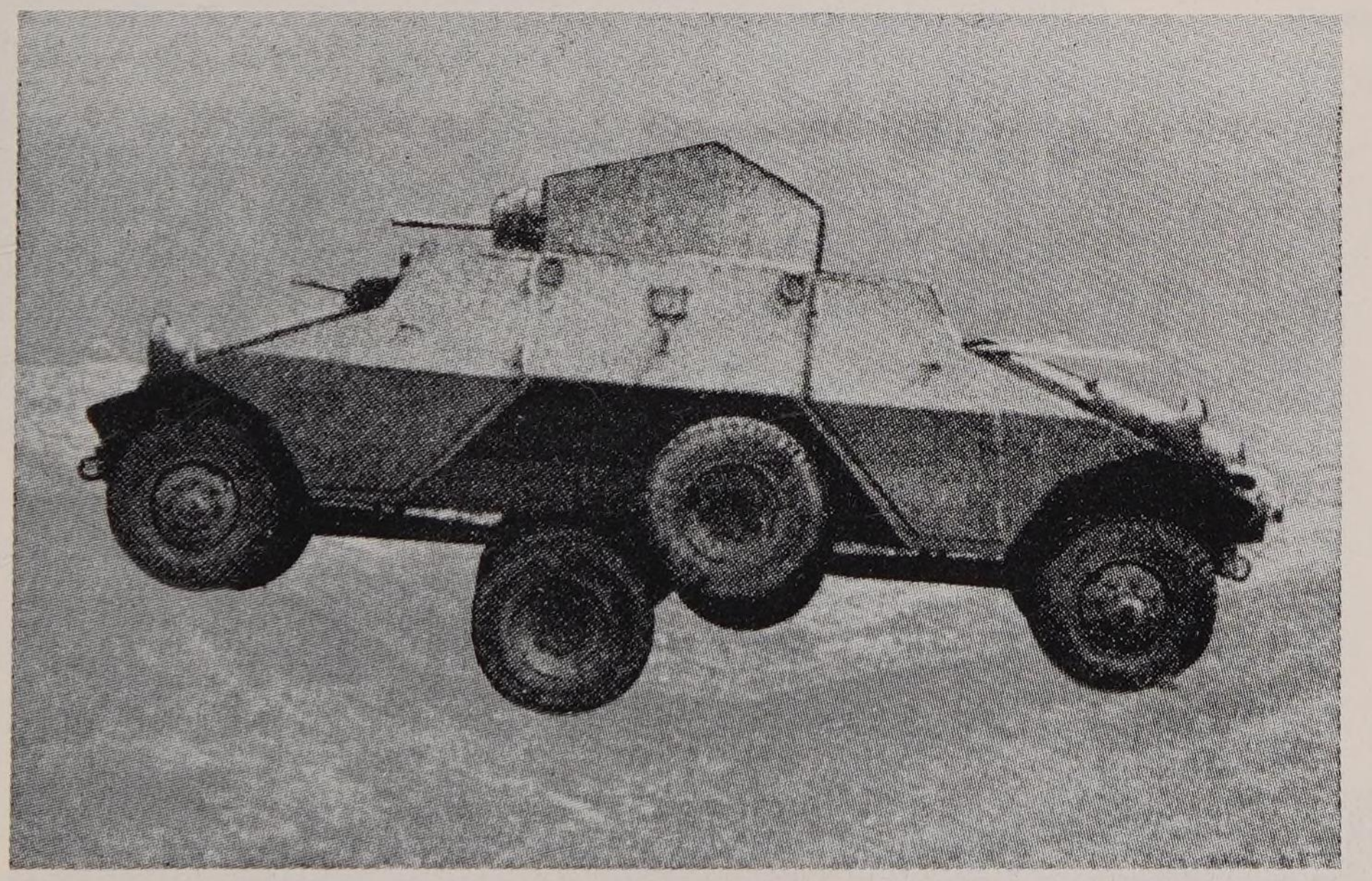
In 1938 the Italians produced the Autoblinda 40, which became their standard vehicle. This was a 4 x 4 vehicle, with dual driving controls in reverse, weighing 6.7 tons. The armament, in a rotating turret, consisted of a 20 mm. Breda cannon and co-axial 8 mm. machine gun. The engine was located at the rear and spare wheels were carried in recesses in the hull sides in such a way as to provide additional ground contact in soft ground.



*Italian Autoblinda 40*

The German Army continued to develop their heavy armoured cars after the first War until 1921 and produced a few four wheel drive, 11 ton vehicles for internal security duties.

Between 1927 and 1929 the Daimler-Benz company produced the MTW. This was an eight wheel drive, large tyred vehicle with independent suspension but without conventional chassis construction. This was succeeded in the early thirties by 6 x 6 and 8 x 8 types produced both in Austria and Germany.

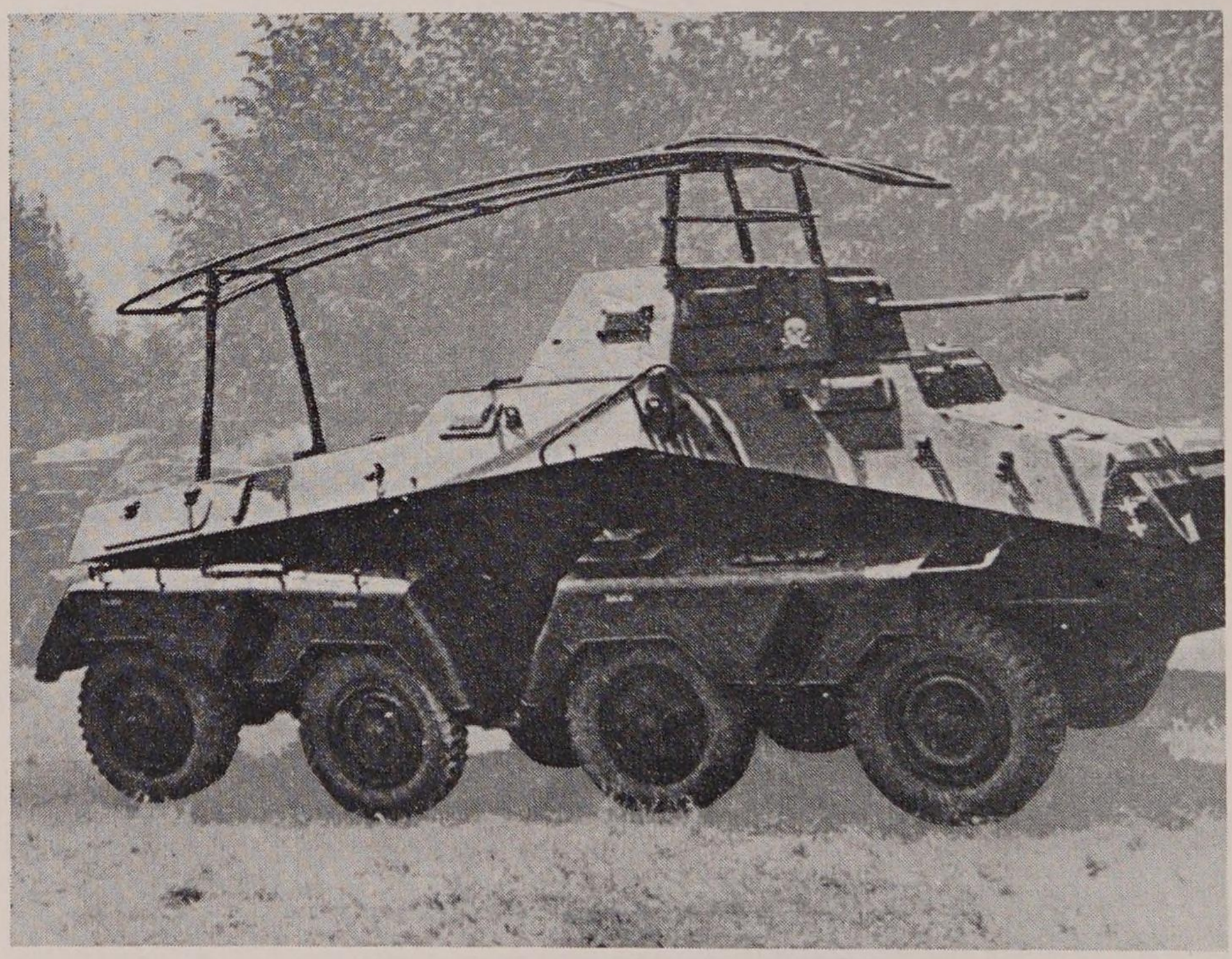


*Austrian ADGZ*

One was the Austrian Steyr-Daimler-Puch, known as the ADGZ. It was an 8 ton vehicle with dual controls which went into limited production in 1934 and was tested in Great Britain in 1938. This car had the Voith-Getriebe hydro-kinetic torque converter transmission and was a first in this respect. Before being absorbed by Germany the Austrians also produced a 6 x 6 ADKZ and a 4 x 4 ADSK but after occupation the production of Austro-Daimler armoured cars was stopped. Others, produced in Germany itself between 1933 and 1936 were still based on commercial chassis as was the case in Great Britain. These were mainly the ASP-6, the Sd.KFZ 13, and the heavier Bussing-NAG, 6 ton Sd.KFZ 231. The ASP-6 was a six wheeled armoured car with angled armour plates, dual control for reversing and mounting a 20 mm. cannon with a co-axial machine gun in a traversing turret.

The Sd.KFZ 13 was a light 4 x 2 car built on the Adler chassis with a crew of three and armed with the MG 34 machine gun only.

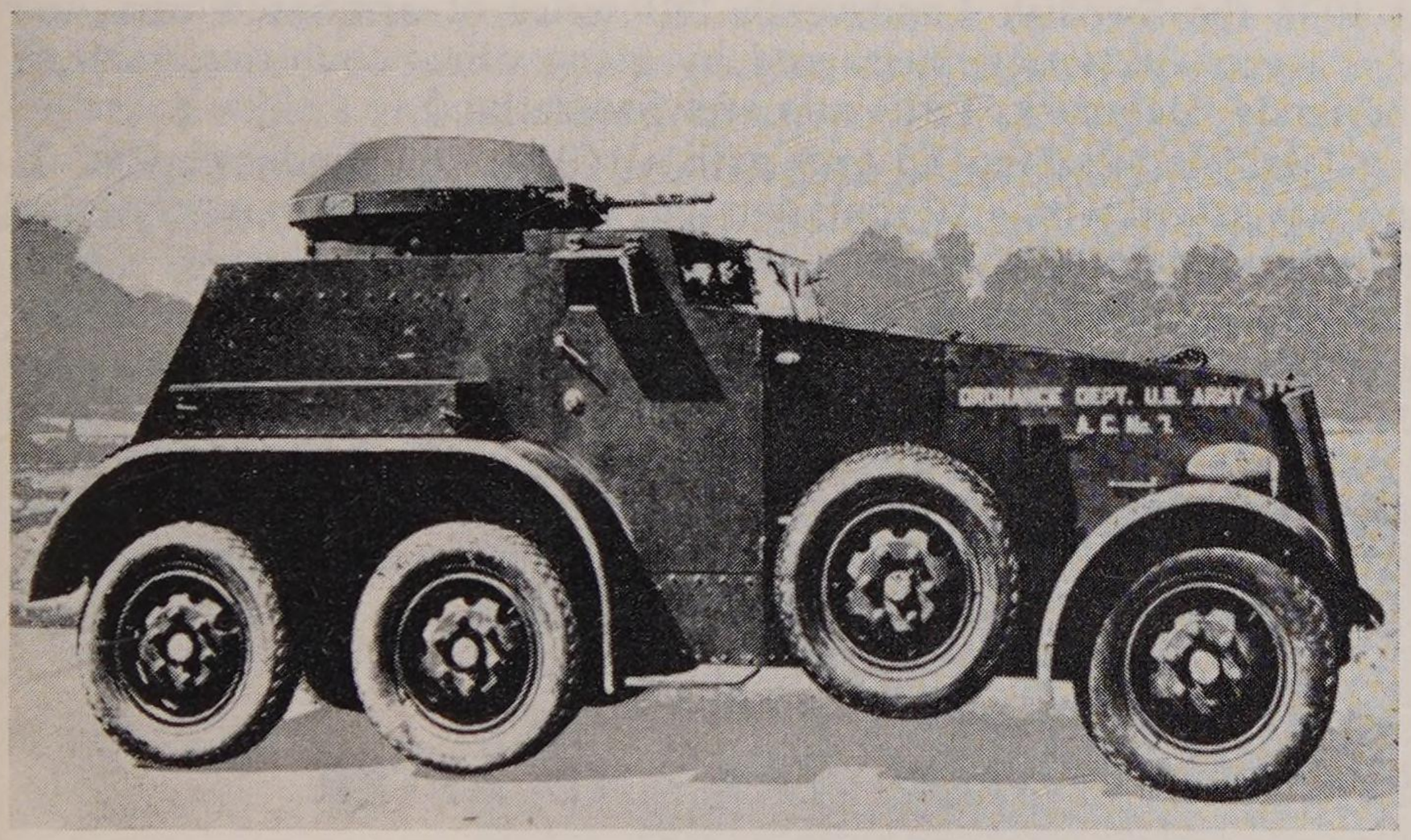
Similar cars under the Sd.KFZ designations 221-222-223 were armed with 20 mm. cannon and a machine gun. The Sd.KFZ 231 series were eight wheeled armoured cars built in 1937. These were also originally fitted with 20 mm. cannon and machine guns but later versions with an open top body mounted a 75 mm. gun. The drive was on all eight wheels, as was steering also.



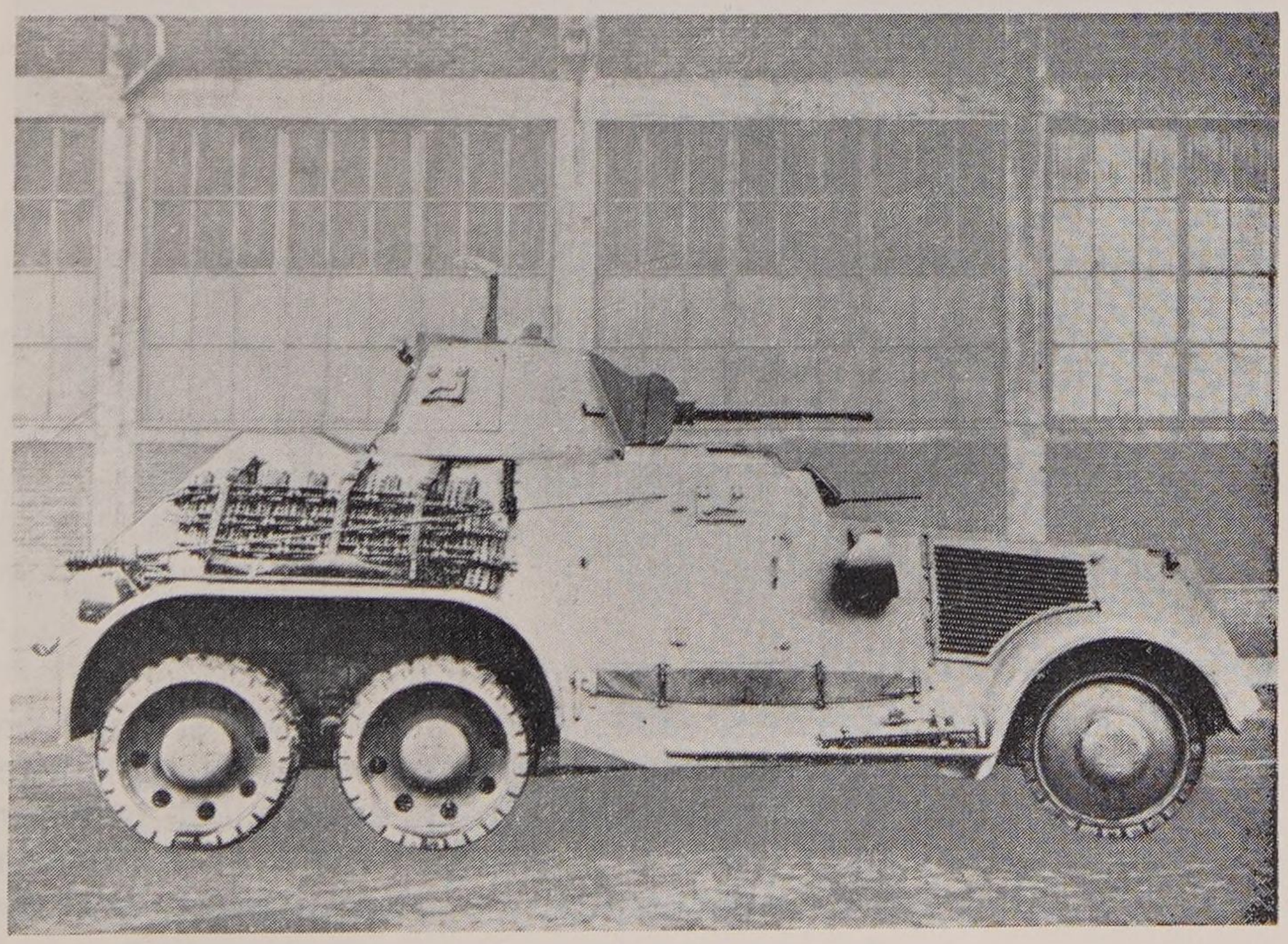
*German Sd.KFZ 232*

Progress in the United States was small before 1941 but they continued and improved the Citröen Kégresse rubber half track type of vehicle and this ultimately resulted in the ubiquitous White half track troop carrier and reconnaissance car used in vast numbers by the Allies between 1941 and 1945 and still in service in Europe today.

Typical of the period were the M1 armoured car of 1931-32, a 6 x 4 five ton vehicle equipped with .50-in. and .30-in. machine guns and the T7 armoured car, built on a standard truck chassis. Later came the T13, an eight wheeled vehicle in which the six rear wheels were chain driven. It weighed 11 tons.



*American M1*
*Armoured Car*
*1931-1932*



*Swedish L.180*
*Armoured Car*
*1935*

Between 1933 and 1938 the Swedish Landsversk 180 series of armoured cars was produced. These were a successful design purchased by many other countries, such as Eire, Finland, the Netherlands, Denmark, Lithuania and Switzerland.

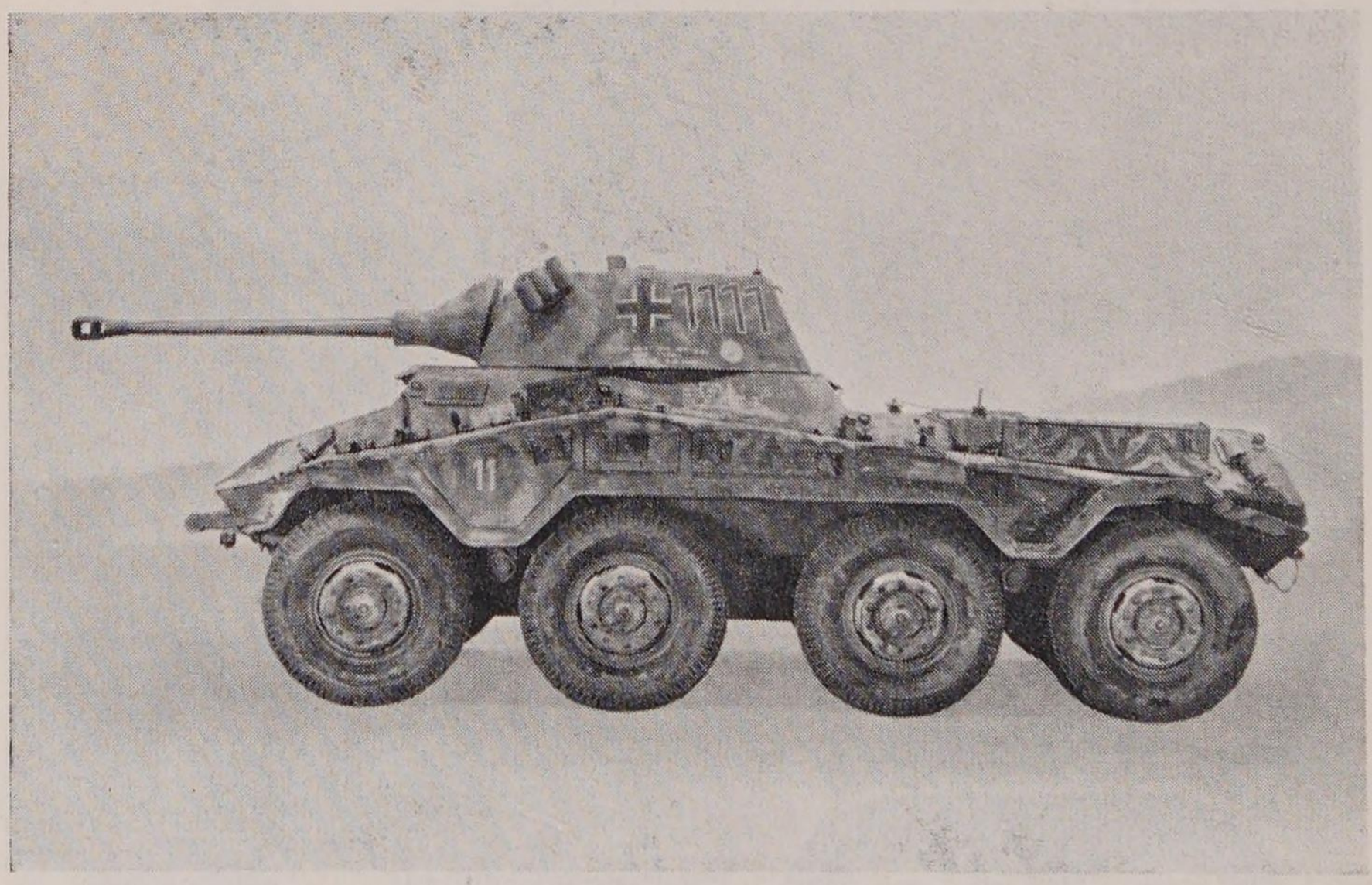
The L.180 was a 6 x 4 vehicle weighing 7.7 tons with a 160 h.p. 6 cylinder engine. It carried a crew of five and was armed with a 20 mm. gun and a machine gun in a traversing turret. There were two hull mounted machine guns in addition.

The L.182 and L.185 were of similar type but the L.182, also a 6 x 4 vehicle, weighed only 6.1 tons and had dual forward and reverse ability by means of a duplicated transmission.

The L.185, a 4 x 2 vehicle, also had dual forward and reverse ability but weighed even less—4.6 tons. Both these cars were armed with 20 mm. cannon and a machine gun co-axial in a rotating turret. Swedish armoured cars were notable for their excellent observation, provided by all round vision periscopes and periscopic gun sights.

## THE SECOND WORLD WAR AND AFTER

The standard German armoured cars of the second World War were the 4 x 4 Auto Union Horsch 801 and the heavy eight wheel chassis developed by Bussing-NAG.

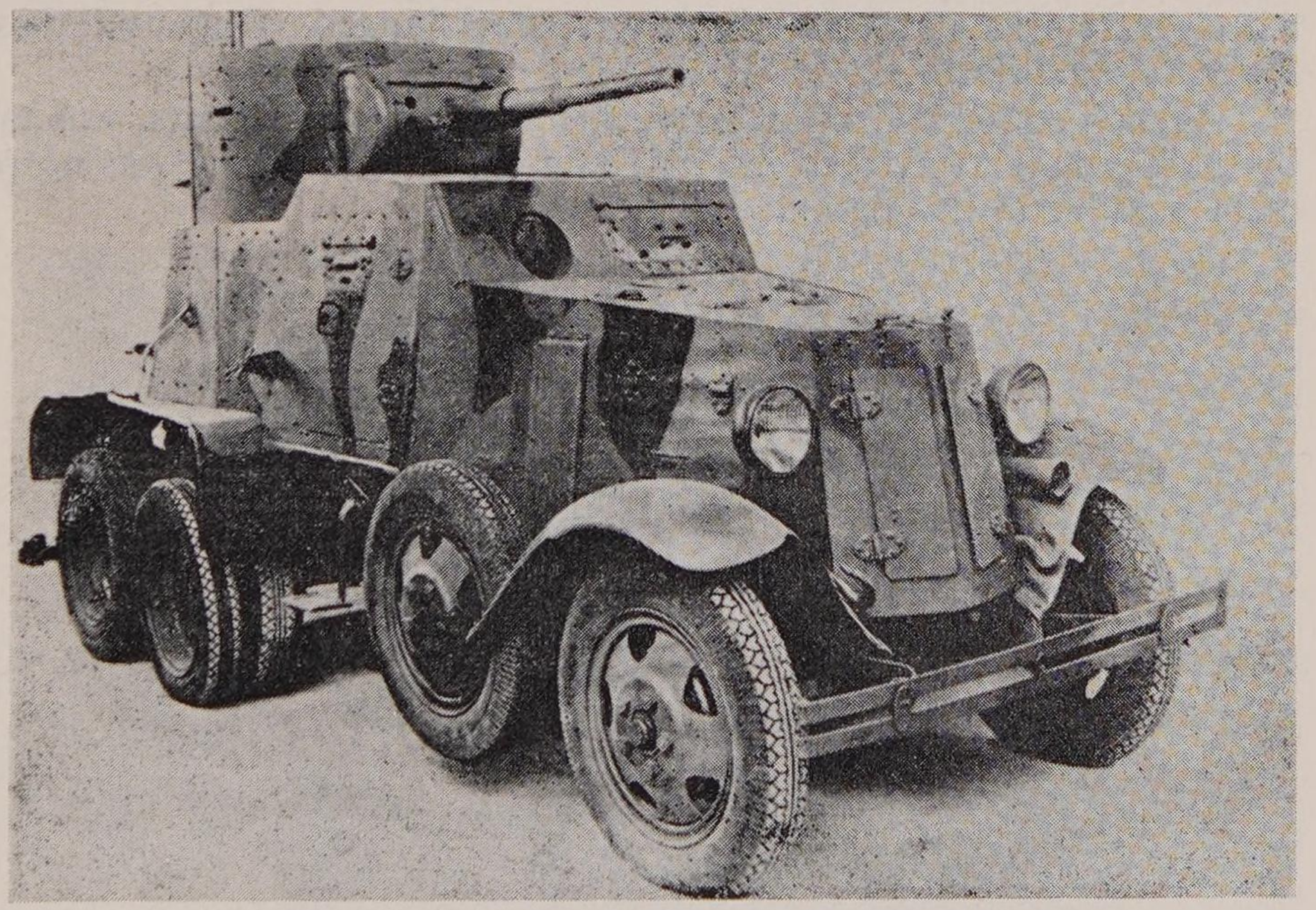


*German*
*Sd.KFZ 234*

All had similar features, independent suspension, steering on all wheels and rear mounted engines. The eight wheel version drove on all eight wheels by means of inter axle and interwheel differentials. This car had an excellent performance off roads despite its complicated structure. There were a large number of variants on all these chassis, the main difference being the armament and whether a turret was fitted or not. Armament

varied from machine guns and 20 mm. cannon to long and short barrelled 75 mm. guns. The eight wheel version was also used as an armoured command vehicle as well as a reconnaissance vehicle and an armoured car.

The Germans also made extensive use of half and three quarter tracked vehicles, some of which were fitted with armoured bodies and mounted machine guns or 20 mm. cannon. In this development they differed from other countries in that they used overlapping, rubber tyred bogie wheels which was also a feature of their heavy tank suspensions. The tracks were of steel and rubber block construction whilst the bogies were mounted on torsion bars and the tracks linked to the front wheels to assist in steering.



*Russian BA 10*

It is interesting to note that the Russians who, in the past, had shown themselves to be very armoured car minded and had purchased and used many foreign designs, stuck to conventional 4 x 2 and 6 x 4 truck chassis for their basic equipment between 1939 and 1945.

It is possible that a lack of production potential and a shortage of technicians was responsible for this situation as it is significant that, as soon as conditions permitted, the Soviet Army was equipped with a high proportion of specially designed vehicles and this trend continues today.

It is also of interest that the BA 10 had a 45 mm. gun as early as 1935, at a time when other countries were fitting only machine guns or, at best, 20 mm. cannon.

In the United States the British experiences in Libya caused a revival of armoured car development and they produced and used vehicles based on Marmon-Herrington chassis and the Staghound and Greyhound in the early days of the second war.

After 1943, however, their development was towards lighter vehicles. The standard

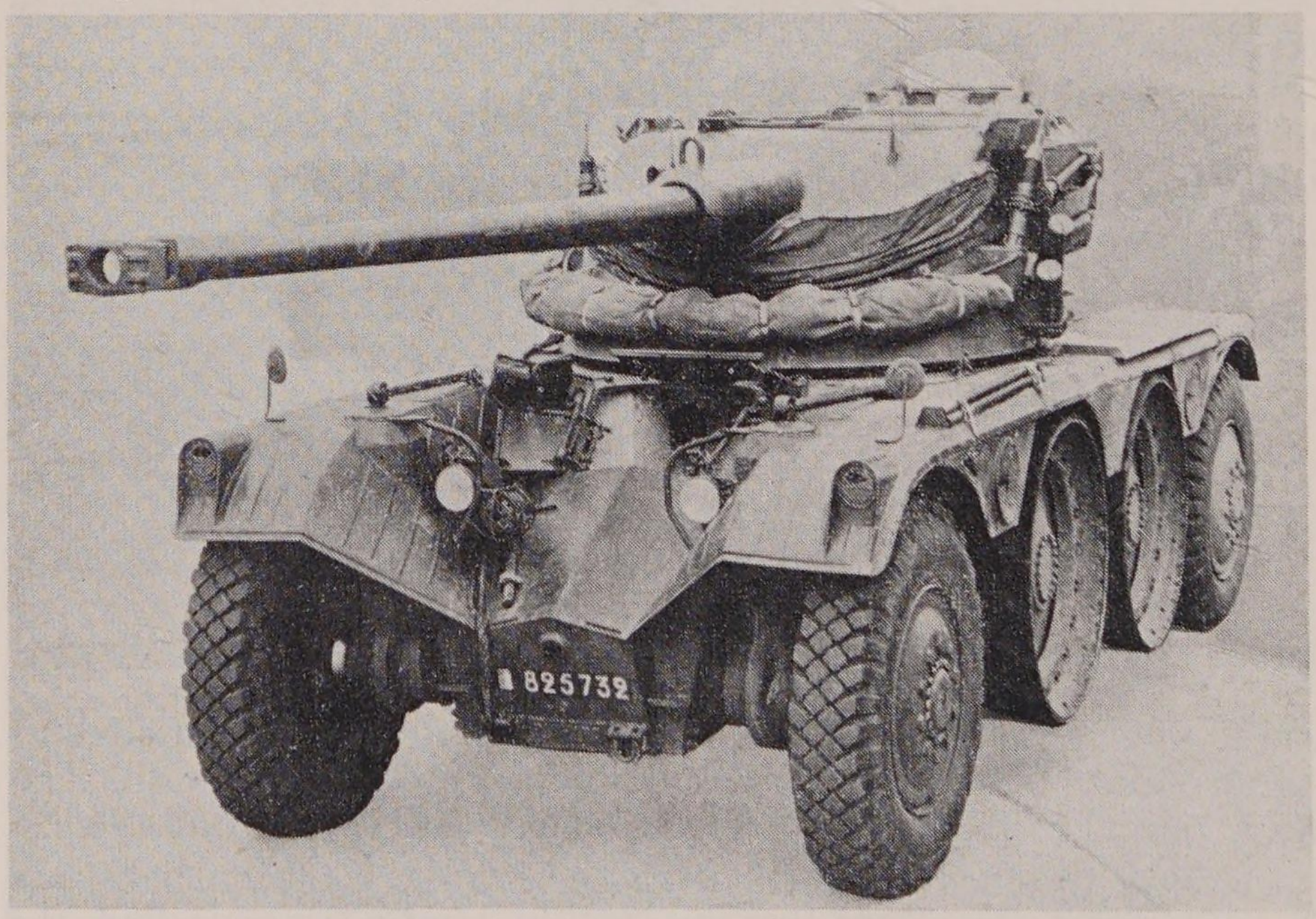
car of this type was the M.8 already described on page 39. Its successor, which appeared at the end of the war, was the G.M.C. built T.28.

This car had evenly spaced axles, independent suspension, servo-assisted steering on the front four wheels and weighed 6.8 tons.

Its performance was much better than the M.8 but despite this it never went into quantity production. This was due to a policy change in favour of the better cross country performance of the fully tracked armoured fighting vehicle which resulted in the virtual stoppage of armoured car development.

Japanese armoured car development is mainly notable for their Sumida 6 x 4 vehicle which was specially designed to run on railway lines as well as roads. Both pairs of rear wheels were driven and the wheels were steel flanged. They used these rail mounted cars in fairly large numbers.

French equipment of all types, including armoured cars, was taken over and adapted by the German Army between 1941 and 1945 so that there was no purely French development possible in this period.




*French EBR Armoured Car*

Since then, however, France has produced the Panhard eight wheeled armoured car based on the experimental Panhard 201 of 1940. It has two heavily spudded retractable centre wheels, one on each side, which can be raised clear of the ground for road movement. Known by the designation EBR, this car has an air cooled, horizontally opposed, flat 12 cylinder engine developing 200 b.h.p. As is now common practise, it can be steered from either end by duplicate controls and two drivers are included in the crew of four. The fully traversing turret mounts a 75 mm. gun and co-axial machine gun at a total weight of 13½ tons. Later versions are fitted with the oscillating turret from the AMX 13 tank and the 75 mm. gun has automatic loading.

Printed by
Henry Ling Ltd., The Dorset Press
Dorchester, Dorset

*O7-CXW-163*